





# REPORT

on

## League of Nations Regional Health Conference at Cape Town, South Africa

*November 15—25, 1932*

By

**Major-General J. D. GRAHAM, C.B., C.I.E., K.H.S., I.M.S.,**

*Public Health Commissioner with the Government of India,  
and Delegate for British India.*

CALCUTTA  
GOVERNMENT OF INDIA PRESS  
1933



## CONTENTS.

	Page.
List of Delegates . . . . .	1
Agenda . . . . .	3
Committees . . . . .	6
Programme of Conference Work . . . . .	7
Preamble . . . . .	10
Yellow Fever . . . . .	13
(i) Dr. Sawyer's memorandum . . . . .	14
(ii) Dr. Duff's memorandum . . . . .	25
(iii) Final Report of Conference . . . . .	41
Plague . . . . .	58
Small-pox . . . . .	62
Leprosy . . . . .	70
Rural Hygiene . . . . .	72
Dengue . . . . .	72
Comments . . . . .	74
(Complete list of Appendices 1 to 32 (see Note *).	
APPENDIX 4.—Roekefeller Commission Schedule for blood examination . . . . .	79
" 6.—Note on discussions on the Air Sanitary Convention by Sir Geo. Buchanan . . . . .	82
" 8.—Aerodrome map and schedule . . . . .	85
" 10.—Report of discussions on Dr. Sawyer's memorandum . . . . .	88
" 11.—Report of discussion of Sir Geo. Buchanan's exposé on the Air Sanitary Convention . . . . .	92
" 12.—Report of discussion on Dr. Duff's memorandum . . . . .	94
" 20.—Final Report on Plague by Dr. Lee (Rapporteur) adopt- ed by Conference . . . . .	97
" 21.—Leprosy in the Union of South Africa by Dr. Willmot, Assistant Health Officer of Union . . . . .	101
" 22.—Report by Sub-Committee on Leprosy as adopted by the Conference . . . . .	104
" 23.—Memorandum for discussion by Sub-committee on Small- pox by Dr. Scott (Rapporteur) . . . . .	106
" 25.—Memorandum on Precautions against Small-pox at the Port of Durban by Dr. Park Ross . . . . .	108
" 30.—Report by the Sub-committee on Rural Hygiene as adopted by the Conference . . . . .	113
" 31.—Report of the Dengue Sub-committee as adopted by the Conference . . . . .	117
" 32.—Resolutions . . . . .	1

\* NOTE.—Appendices in original are retained in office of Public Health Commissioner. Certain of these which are of great importance to Govern-  
ment of India are reproduced either in the body of the Report or in the  
Appendix for easy reference.



# REGIONAL HEALTH CONFERENCE— LEAGUE OF NATIONS.

CAPE TOWN—NOVEMBER, 1932.

## LIST OF DELEGATES.

Full Name and Qualifications.	Official Position.	Country Represented.
Buchanan, Sir George Seaton, C.B., M.D., F.R.C.P.	Senior Medical Officer, Ministry of Health, Whitehall, London; Vice-President, Health Committee, League of Nations; President, Office International d'Hygiène Publique, Paris.	League of Nations.
Thornton, Col. Sir Edward N., K.B.E., V.D., M.R.C.S. (Eng.), L.R.C.P. (Lond.), D.P.H. (Camb.).	Secretary for Public Health and Chief Health Officer.	Union of South Africa.
Park, Charles Leslie, M.D., D.P.H.	Director, Eastern Bureau, League of Nations, Singapore.	League of Nations.
Graham, Gen. James Drummond, C.B., C.I.E., K.H.S., I.M.S., M.B., D.T.M. & H., etc.	Public Health Commissioner with the Government of India.	British India.
Sawyer, W. A., M.D.	Associate Director, International Health Division, Rockefeller Foundation, New York.	Rockefeller Foundation.
Hinsbeek, Frank, C. S., B.A. (Cape), M.B., Ch.B., D.P.H. (L'pool).	Medical Officer to the Administration.	Mandated Territory of South West Africa.
Johnson, W. B., F.R.C.S., M.B., B.S.	Director of Medical and Sanitary Service.	Nigeria, West Africa.
Willmot, Col. F. C., M.D., D.P.H.	Senior Assistant Health Officer.	Union of South Africa.
MacLennan, Norman Macpherson, M.D., D.P.H., D.T.M. & H.	Ag. D. D. S. S., Northern Rhodesia.	Northern Rhodesia.
Morris, Richard Murchison, M.D., D.P.H., D.T.M. & H.	Government Medical Officer, Southern Rhodesian Medical Service.	Southern Rhodesia.
Duff, David, M.D., D.P.H.	D.M.S.S., Gold Coast.	Gold Coast.

Full Name and Qualifications.	Official Position.	Country Represented.
Gilks, John Langton, F.R.C.S. (Ed.), M.R.C.P. (Eng.), L.R.C.P. (Lond.)	D. M. S. S., Kenya Colony and Protectorate.	Kenya.
Lee, S. W. T.	Senior Health Officer . .	Uganda .
Damas Mora, Col. A., M.D.	D. M. S. S., Angola . .	Angola.
deSouza, Jacinto, M.D.	Director of Central Laboratory.	Mocambique.
Dyke, Hamilton William, M.B.	Principal Medical Officer .	Bechuanaland Protectorate.
Orenstein, Alexander J., C.M.G., M.D., M.R.C.S., etc., LL.D. (Hon.)	Superintendent of Sanitation, Central Mining Rand Mines, Johannesburg; Lecturer in Tropical Medicine, Univ. of the Witwatersrand.	Union of South Africa.
Park Ross, George Archibald, M.D. (Edin.), D.P.H.	Senior Assistant Health Officer.	Union of South Africa.
Scott, Ralph Roylance, M.C., M.B., B.S. (Durh.), M.R.C.S., L.R.C.P., D.P.H.	Senior Health Officer . .	Tanganyika Territory.
duToit, Petrus Johann, B.A., Ph.D., D.Sc., Dr. Med. Vet.	Director of Veterinary Services.	Union of South Africa.
Smith, William Harden, B.A., M.B., B.Ch., B.A.O., D.P.H., D.T.M., L.M.	Health Officer . . .	Zanzibar.
Nattle, Harold Rundle Fitz, M.R.C.S. (Eng.), L.R.C.P. (Lond.)	Principal Medical Officer .	Basutoland.

# AGENDA FOR THE CONFERENCE.

1ST PLENARY SESSION—15TH NOVEMBER, 1932.

The Secretary for Public Health, Union of South Africa, temporarily took the Chair.

## I. Election of—

- (1) Chairman of Conference.
- (2) Deputy Chairman of Conference.

## II. Address by Chairman.

## III. Announcement of invitations to various functions.

## IV. Announcement of arrangements for secretarial work and proposals for supplying information to the Press.

## V. Adoption of Order of Business of Conference—

*For consideration in Plenary Session:—*

### (1) Transmission of Yellow Fever:

- (a) Statement of present knowledge of epidemiology, including information regarding the delimitation of endemic areas, by Dr. W. A. Sawyer.

The Chairman will invite questions by delegates on matters arising from the statement.

- (b) Statement of principles of Draft Convention for the Sanitary Control of Aircraft, by Sir George Buchanan.

The Chairman will invite questions by delegates on matters arising from the statement.

- (c) Statement by existing and projected air-routes.

Any supplementary information known to Delegates.

- (d) Information from Delegates of each country represented as to measures now applied or proposed to be taken—particularly in relation to the prevention of the transmission of Yellow Fever by aircraft—by:

- (i) The Governments of countries in which Yellow Fever is endemic;

- (ii) The Governments of countries which are infectible by Yellow Fever.

- (e) General discussion of matters arising from the above statements.

### (2) Other diseases that might be transmitted by aircraft:

- (a) Human diseases (Plague, Cholera, Typhus and Small-pox) and measures proposed to be taken under the Draft Convention.



- (b) Animal diseases—statement to be submitted by the Director of Veterinary Services for the Union of South Africa.
- (3) (a) Statement of position in regard to, and methods employed to combat, Plague in—
  - (i) Union of South Africa and Mandated Territory of South-West Africa;
  - (ii) Angola;
  - (iii) Kenya;
  - (iv) Uganda;
  - (v) Bechuanaland Protectorate
  - (vi) Other African countries.
- (b) General discussion on these statements.
- (4) Any other subject desired by Delegates.

*For preliminary consideration in Committee:—*

- (1) The adoption of uniform regulations for the prevention of the introduction into Southern and Eastern Africa of Small-pox from India.
- (2) The ratification by the interested countries of the Dengue Fever Convention.
- (3) The control of Leprosy in Africa (with special reference to the Manila and Bangkok Conferences on Leprosy).
- (4) The provision of rural health and medical services in Africa, particularly in Native areas.

VI. Appointment of Committees—

- (1) Bureau of Conference—consisting of
  - The Chairman, Deputy Chairman, General Secretary, supplemented by the Rapporteurs for the framing of reports and resolutions.
- (2) Yellow Fever Committee.
  - Appointment of Rapporteur.
- (3) Plague Committee.
  - Appointment of Rapporteur.
- (4) Small-pox Committee.
  - Appointment of Rapporteur.
  - Constitution: Delegates from the countries actually concerned, namely—Kenya, Zanzibar, Tanganyika, Portuguese East Africa, India, and the Union of South Africa.
- (5) Dengue Fever Committee.
  - Appointment of Rapporteur.

Constitution: Delegates from the countries interested, namely—Kenya, Zanzibar, Tanganyika, Portuguese East Africa, and the Union of South Africa.

(6) Leprosy Committee.

Appointment of Rapporteur.

Constitution: Delegates from Basutoland, Southern Rhodesia, Northern Rhodesia, British India, Union of South Africa, Uganda, and Nigeria.

(7) Rural Hygiene Committee.

Appointment of Rapporteur.

Constitution: Delegates from Bechuanaland, Southern Rhodesia, Angola, Uganda, British India, Gold Coast, Portuguese East Africa, Kenya, Tanganyika, and the Union of South Africa.

*Subjects to be considered outside the Conference:—*

- (1) Questions on medical degrees and qualifications in the Union.
- (2) Medical inspection of passengers from East Africa and South Africa before embarkation for India.
- (3) Fumigation of ships. Certain aspects of the traffic between Bombay and the Union.

## CONSTITUTION OF COMMITTEES.

1) *Scullapuz:*

Dr. Gilks (Chairman).  
 Dr. Smith.  
 Dr. de Sousa.  
 General Graham.  
 Dr. Park Ross.  
 Dr. Scott (Rapporteur).

(2) *Dugues:*

Dr. Gilks (Chairman).  
 Dr. Smith.  
 Dr. Scott.  
 Dr. de Sousa.  
 Dr. Park Ross (Rapporteur).

(3) *Lepeony:*

General Graham (Chairman).  
 Dr. Nettle.  
 Dr. Macleanman.  
 Dr. Morris.  
 Dr. Lee.  
 Dr. Johnson.  
 Dr. Willmot (Rapporteur).

(4) *Rural Hygiene:*

General Graham (Chairman).  
 Dr. Dams Mora.  
 Dr. de Sousa.  
 Dr. Hamilton Dyle.  
 Dr. Duff.  
 Dr. Gilks.  
 Dr. Orenstein (Rapporteur).

# PROGRAMME OF CONFERENCE WORK.

Tuesday, Nov. 15th—

*Forenoon.*—Formal opening by Administrator of Cape Province.

*Afternoon.*—Plenary session. Election of Chairman, Vice-Chairman; constitution of Sub-committees and election of Chairman and Rapporteurs; adoption of provisional agenda; procedure; order of business; first meetings of Sub-Committees to elect Chairmen and to arrange business.

Wednesday, Nov. 16th—

*Forenoon.*—Plenary session.

Yellow fever paper by Dr. Sawyer; questions on this and Dr. Sawyer's answers.

*Afternoon.*—Plenary session.

Aerial Sanitary Convention and its provision for Yellow Fever by Sir G. Buchanan; documentation, questions regarding this document and its implications, and Sir G. Buchanan's replies.

Thursday, Nov. 17th—

*Forenoon.*—Plenary session.

(i) A further statement by Sir G. Buchanan, at my instigation, on the "spirit" of the Convention in view of his remarks on November 16th.

(ii) Paper on Yellow Fever in Gold Coast by Dr. Duff. Questions and answers by Dr. Duff.

(iii) Special remarks by Dr. Johnson on (ii) and emphasising certain points. Comments.

(iv) Statements by all the delegates in turn regarding yellow fever.

*Afternoon.*—Sub-committee.

Sub-committee on Rural Hygiene (2nd meeting).

Friday, Nov. 18th—

*Forenoon.*—Plenary session.

(i) Note on veterinary aspects of yellow fever work by Dr. du Toit.

(ii) General Graham's remarks regarding India's position on yellow fever.

(iii) General discussion on yellow fever continued.

*Afternoon.*—Sub-committee.

Sub-Committee on Rural Hygiene (3rd meeting).

Saturday, Nov. 19th—

*Forenoon.*—Sub-committee.

Sub-committee on Leprosy (2nd meeting).

Sunday, Nov. 21st—

*Forenoon.*—Plenary session.

- (i) Plague in Union of South Africa. Papers by Sir E. Thornton and by Dr. Heinboeck.
- (ii) Plague in Angola. Dr. Morn's paper on Angola Plague.
- (iii) Statements by all the African delegates in turn.
- (iv) General discussion in which General Graham gave an exposé regarding Indian plague questions.

*Afternoon.*—Sub-committees.

- (i) Small-pox (2nd meeting).
- (ii) Dengue (2nd meeting).

Tuesday, Nov. 22nd—

*Forenoon.*—Sub-committees.

- (i) Rural Hygiene (4th meeting).
- (ii) Small-pox (3rd meeting).

*Afternoon.*—Sub-committees.

- (i) Medical qualifications discussion (*ex-Conference*).
- (ii) HCN deratting demonstration.

Wednesday, Nov. 23rd—

*Forenoon.*—Sub-committees.

- (i) Leprosy (3rd meeting).
- (ii) Small-pox (4th meeting).

*Afternoon.*—Plenary session:

- (i) Rural Hygiene Sub-committee report submitted.
- (ii) Small-pox Sub-committee report submitted.

Thursday, Nov. 24th—

*Forenoon.*—Plenary session.

- (i) Yellow fever report submitted.
- (ii) Plague.
- (iii) Small-pox Sub-committee report submitted.

*Afternoon.*—Leprosy Sub-committee (4th meeting).

Discussion (*ex-Conference*) on Fumigation and medical examination of passengers as between British India and the Union.

Friday, Nov. 25th—

*Forenoon.*—Plenary session.

- (i) Plague sub-committee report submitted.
- (ii) Leprosy sub-committee report submitted.
- (iii) Dengue sub-committee report submitted.

I circulated my two Memos. regarding Fumigation and regarding Examination of Passengers to all concerned.

*Afternoon.*—Plenary session.

- (i) Plague sub-committee report amendments.
- (ii) Miscellaneous resolutions.
- (iii) Preamble.
- (iv) Thanks and closing of Conference.

## LEAGUE OF NATIONS—HEALTH ORGANISATION.

### International Conference of Medical Representatives of the Health Services of certain African Territories and British India—Held at Cape Town on 15th November 1932.

---

#### PREAMBLE.

Early in 1932 the Medical Director received a communication from the Secretary for Public Health and Chief Health Officer of the Union Health Department of South Africa, recalling a proposal which had been made at the sixteenth session (October, 1930) of the Health Organisation and the Public Health Administrations of African countries. In this communication it was explained that there were a number of questions relating to public health administration and protection against epidemic diseases on which the Health Department of the Union considered it important to hold a Conference with other Administrations. Before taking up this question, however, with the African and other Administrations concerned, he desired to know whether the League of Nations Health Organisation would call the Conference and be represented at it.

This communication, with other relevant information, was considered by the Bureau of the Health Committee which met in Paris in May last, when it was decided that the request should be agreed to. It was subsequently settled to hold the Conference in Cape Town on 15th November and accordingly invitations were issued to the Governments of a large number of African countries, to the Government of British India as well as to the Rockefeller Foundation, to be represented.

The Bureau, with the subsequent assent of the Health Committee at its nineteenth session at Geneva, in October 1932 (Official Minutes, C. 725, M. 344, 1932), nominated Sir George Buchanan to represent that Committee at the Conference, and Dr. C. L. Park, Director, Eastern Bureau at Singapore, to be its General Secretary. Sir George Buchanan, by request, submitted at that session a report upon the scheme of the Conference, the circumstances which had led up to it, and the position which it seemed desirable that the representative of the Health Committee should adopt in regard to the questions to be discussed. This statement (C. H. 1107, App. No. I) which had previously been agreed with the President of the Office of International d'Hygiene Publique in respect of the questions with which that body was concerned, was approved by the Health Committee and also communicated, for information, to the

Permanent Committee of that Office at the session which immediately followed that of the Health Committee.

In accordance with instructions received under India Office, E. and O. Department, letter No. 6693/1932, dated 15th October 1932, and the High Commissioner for India, letter No. K. G. 121-1-144, dated 18th October 1932, I left the autumn session of the Office International d'Hygiene Publique in Paris on October 26th, crossed to London, left London on October 28th and embarked on the S.S. " Balmoral Castle " at Southampton on the same date *en route* to Cape Town to attend, as delegate of the Government of British India, the Regional Health Conference which had been convened by the League of Nations at the instance of the Government of the Union of South Africa on November 15th.

The objects of this Conference, as proposed by the Government of the Union, were " to discuss the prevention of Yellow Fever in Africa in connection with the draft International Convention for the Sanitary Control of Aerial Navigation, the adoption of uniform regulations for the prevention of the spread of small-pox from India, and to study problems arising out of the continuous prevalence of plague in certain areas of South Africa, as well as those relating to the organisation of rural medical health services ".

I was accompanied on the S.S. " Balmoral Castle " by Sir Geo. Buchanan, Kt., C.B., of the Ministry of Health, who was representing the League of Nations, by Dr. Wilbur Sawyer, Associate Director of the International Division of the Rockefeller Foundation of New York, who had been specially invited in view of his intimate association with the Foundation's work on Yellow Fever in West Africa and America, and by Dr. Duff, Principal Medical Officer of the Gold Coast. We arrived at Cape Town on 14th November, were installed with the other delegates for the period of the Conference at Mount Nelson Hotel, as guests of the South African Government, and commenced the work of the Conference next day (15th November).

The Conference was opened at 11 A.M. on November 15th, in the House of Assembly, Parliament Street, by the Hon'ble J. H. Conradie, Administrator of the Cape Province, who took the chair in the absence of the Minister of Public Health, and was supported by His Worship the Mayor of Cape Town. The Press and members of the public attended including the Vice-Chancellor of the University of Cape Town, the Bishop and Dr. Mitchell, former Secretary to the Union Health Department. After a roll call of the delegates,—22 in all,—the Chairman welcomed them on behalf of the Government of the Union of South Africa as did also His Worship the Mayor of Cape Town. The Hon'ble Mr. Conradie, referring to the representative personnel of the delegates, said the Conference realised the wish of the Union for greater co-operation between the health organisations of the League and the public health administrations of Africa in the combating and control of diseases of vital interest to the various countries, particularly when regard was had



to the possibilities of infection spreading through modern methods of transport. He paid a tribute to the work already accomplished by the Health Section of the League in effecting international co-operation in health matters, and he felt that this Conference would mark another important step forward.

The General Secretary (Dr. Park, Director of the League of Nations Bureau, Singapore) replied on behalf of the League of Nations and the following delegates then spoke by request: Sir G. Buchanan as representing the Health Committee of the League of Nations; Dr. Damas Mara as representing Portugal; Dr. Duff as representing West African Colonies; Dr. Gilks as representing Central and East African Colonies; Dr. Sawyer as representing the Rockefeller Foundation of New York; and Major-General J. D. Graham as representing British India.

The Conference was thereafter adjourned till 2-30 p.m.

The 22 delegates attending represented League of Nations; Rockefeller Foundation; British India; Angola (Portuguese West Africa); Mocambique (Portuguese East Africa); Kenya; Uganda; Zanzibar; Tanganyika; Bechuanaland in Swaziland; Basutoland; Southern Rhodesia; Northern Rhodesia; Nigeria; Gold Coast, South West Africa; Union of South Africa (*vide* list attached, page 1).

Provisional agenda had been drawn up (*vide* page 3) and were considered at the first meeting on the afternoon of November 15th at which Sir Geo. Buchanan was unanimously elected Chairman of the Conference and Sir Edward Thornton, Deputy Chairman. The Chairman addressed the delegates generally dealing with the *raison d'être* of the Conference, its being convened by the League and the meaning of this, the rôle of the League in regard to such a Conference, the documentation which would be available and the new Aerial Sanitary Convention of 1932. He then dealt with procedure and language in regard to the work of the Conference; its Secretariat; the order of business, which was adopted as published in the provisional agenda referred to; and contact with the press.

Four Sub-Committees on Small-pox, Leprosy, Rural Hygiene and Dengue were constituted (*vide* page 6). I was a member of the first three and was elected Chairman of those on Leprosy and Rural Hygiene. A programme of work was formulated (*vide* page 7).

It was agreed that the Conference should meet from 9-30 to 12-45 and from 2-30 to 6 p.m.; that a summary of the work of the plenary sessions should be issued from time to time; that Sub-Committees should not report individual views in their discussions but present a report to the plenary conference; that periodical statements should be prepared for the press; that yellow fever should be considered first in the plenary Conference, followed by other diseases likely to be carried by aircraft, and by the reports of the Sub-Committees. It was agreed to allow all delegates interested to attend any of the Sub-Committees and selected Medical Officers of Health to attend as observers; also that certain specific questions regarding

matters which had arisen between Government of India and the Union and the East African Colonies be considered outside the Conference at a favourable opportunity, *e.g.*, fumigation and examination of deck passengers for India in the Union.

The Committees then met and elected Chairmen and the following Rapporteurs: for Yellow Fever (Dr. Johnson, Nigeria); for Plague (Dr. Lee, Uganda); for Small-pox (Dr. Scott, Dar-es-Salaam); for Dengue (Dr. Ross, Durban); for Leprosy (Dr. Willmot, Union); for Rural Hygiene (Dr. Orenstein, Johannesburg). I was elected Chairman of the Leprosy and Rural Hygiene Committees (*vide* page 6).

## YELLOW FEVER.

Wednesday, 16th November.

This was considered by the Plenary Conference on 16th, 17th, 18th and 24th November.

The Conference opened by hearing prepared statements on the transmission of yellow fever. The first of these was by Dr. Sawyer, who, as former Director of the Yellow Fever Commission of the International Division of the Rockefeller Foundation at Lagos in West Africa for several years and as Director of the Yellow Fever Laboratory in the Rockefeller Institute in New York, was specially qualified to speak on the latest aspects of this disease. Dr. Sawyer, whom I had the good fortune to hear at the meeting of the Yellow Fever Commission of the Office International d'Hygiène Publique in Paris in October 1932, had prepared, during the voyage to Cape Town, a very complete and detailed exposé of the Yellow Fever question, based largely on his own experience, but comprising the results of all the most recent work in the world on this disease. His exposé, which for clarity of expression and conciseness could hardly have been excelled, was read by him and explained before being distributed (see page 14); its title being "The present knowledge of Yellow Fever as it relates to the problems in Africa". It was, as had been expected, a most valuable, lucid and precious contribution to this part of the work of the Conference. It must be studied in detail as it contains much in everyone of its sentences.

Dr. Duff, Principal Medical Officer of the Gold Coast, gave an exposé of his twenty years' experience of yellow fever control in West Africa and on the present position there with regard to it. This also was a very valuable paper.

During the voyage to Cape Town I had had the advantage of discussing this subject both with Dr. Sawyer and Dr. Duff and of learning much of great value from two men who knew the disease intimately at first hand and one of whom (Dr. Sawyer) had suffered from it.

An excellent resumé of this and of other contributions to the discussion was presented by the Rapporteur for Yellow Fever (Dr. Johnson) at the end of the Conference and with certain amend-

ments was adopted as the final Report on Yellow Fever (vide page 58).

The memoranda aforementioned of Drs. Sawyer and Duff and the final report are of such cardinal importance that, at the risk of overburdening the body of this report, I am reproducing them in full instead of burying them amongst the annexures.

After hearing Dr. Sawyer's paper the Chairman suggested that questions should be asked and observations made on the research side and on any of the points touched on by Dr. Sawyer with a view to further explanations by him. He accordingly invited Dr. Johnson of Nigeria to begin these in view of his having been very closely concerned in the work of the Rockefeller Commission at Lagos. These eventually took the form of a series of questions by Dr. Johnson and other delegates full details of which will be found in Annexure No. 10. These which dealt with various subjects I have attempted briefly to summarise in the form of questions and answers and a study of these will be profitable.

Dr. Sawyer, in replying, paid a tribute to the help of the British administrative authorities—especially those of Nigeria—without whose full co-operation and help little would have been accomplished. He welcomed this opportunity for obtaining a fuller knowledge of the disease and for giving the broadest publicity to the facts as, without this, progress would be impossible.

## “THE PRESENT KNOWLEDGE OF YELLOW FEVER AS IT RELATES TO THE PROBLEM IN AFRICA.

By W. A. SAWYER, ASSOCIATE DIRECTOR OF THE INTERNATIONAL HEALTH DIVISION, ROCKEFELLER FOUNDATION.

During the past few years many observations have been made which amplify our knowledge of yellow fever and its epidemiology. For the purposes of this conference I shall select and discuss those which seem to bear on the yellow fever problem confronting the health officials of Africa. It will be unnecessary to make a general summary of the newer knowledge, for that has been done in the recent report, which has been placed before you, of the Yellow Fever Commission of the Office International d'Hygiène Publique. But before taking up my first topic I wish to express for Dr. Russell, Director of the International Health Division of the Rockefeller Foundation, his appreciation of the invitation to send a representative to this important conference and my own satisfaction at being given the opportunity to attend. My one regret is that Dr. Henry Beeuwkes, who is in charge of the Foundation's work in West Africa, could not be here also.

### *The Geographical Distribution of Yellow Fever in Africa.*

Our knowledge of the past and present geographical distribution of yellow fever in Africa has been derived from two principal

sources of information, the published records of clinically recognised yellow fever and the results of recent tests of the population for acquired immunity against the disease. There have been many reports of yellow fever from West Africa from about the middle of the eighteenth century to the present. The majority of these reports came from seaports, the northernmost of which was in Senegal and the southernmost in Angola. There have been, however, a considerable number of reports from points far inland in the region from Senegal to Nigeria. There are no definite records of yellow fever in the interior of French Equatorial Africa, Angola, or in Belgian Congo except along the lower reaches of the Congo River.

As most of the reported cases of yellow fever were among Europeans and Syrians, the greater number were in the cities and towns in which these people lived. Cases in native villages were seldom reported, probably partly because most of the cases were mild, but chiefly because the negro natives, when ill with a febrile disease, only exceptionally came under the observation of a medical man. To explain the source from which Europeans were infected the hypothesis was developed that yellow fever was widespread among African natives in mild unrecognisable form and principally in young children. In 1926, 1927, and 1928 several epidemics were studied by the West African Yellow Fever Commission of the Rockefeller Foundation in native towns of Gold Coast and Nigeria. These studies left no doubt that the West African negro was definitely susceptible to infection with yellow fever and that adults who had escaped infection in childhood would contract the disease later if exposed. In general the disease was observed to be milder in the negro than in any other race which has been investigated, but it was nevertheless not infrequently severe and sometimes fatal, as will be evident when Dr. Beeuwkes publishes his accumulated observations of yellow fever in the negro of West Africa.

New Evidence bearing on the distribution of yellow fever has been obtained by testing the blood of representative groups of natives in many localities for its power to protect susceptible laboratory animals against yellow fever virus. The demonstration of the presence of protective antibodies in the serum is taken as evidence that the donor of the blood has been at some time infected with yellow fever virus. By classifying the results of the tests according to the ages of the donors it is sometimes possible to draw conclusions as to the time and extent of past epidemics. In the earlier studies the animal used was a monkey (*Macacus rhesus*). The results have been published by Beeuwkes, Bauer and Mahaffy (Am. Jour. Trop. Med. 1930. Vol. 10, 9, 305). The use of susceptible strains of whitemice instead of monkeys has made it possible to conduct surveys of yellow fever immunity on a much larger scale. Dr. Beeuwkes has already reported to the Rockefeller Foundation, and the governments concerned, the results of tests of sera from 4,368 natives residing in 92 cities, towns, and villages (Beeuwkes.

H. unpublished reports to the International Health Division, Rockefeller Foundation). The earlier tests in monkeys are included in the total. Most of the sera were collected with government co-operation in Nigeria, Gold Coast, Dahomey, French Niger and French Soudan. Additional specimens were received from Senegal, Sierra Leone, and Liberia. Sera have been collected also in French West Africa by Dr. Stefanopoulos for the Colonial Health Service and tested in the Pasteur Institute in Paris, but the results are not yet available.

The method of making an immunity survey of a region may be briefly summarised. A plan is prepared and the localities for sampling are selected. One or more lots of blood samples, each consisting of 25 specimens, are collected in each of these places from persons who have lived in the vicinity all their lives. If the collections are being made in a region in which yellow fever is believed to have been present, it is preferable to take the specimens from children under ten years of age, so as to get the maximum information regarding recent outbreaks, but if there is reason to believe that the disease has been absent during the life of the present generation, it is best to take samples from adults, so that negative findings will have the greatest possible value. It may be considered advisable to take blood both from children and from adults, 25 samples from each, in places of unusual importance. The names and addresses of the blood donors are carefully recorded, along with the other information required by the forms supplied by the laboratory, so that further inquiry can be made and additional samples taken in the event that the laboratory results show that certain cases need further study. The amount of blood drawn from the arm of the donor is such that at least 10 c.c. of serum may be obtained. In the field the common practice is to use sterile vacuum tubes of 30 c.c. capacity with automatic valves and with needles attached. The specimens are allowed to stand in an upright position until the blood has clotted and are then shipped to the nearest laboratory. When possible the blood samples are kept in a refrigerator while in transit. At this laboratory the serum is transferred to 20 c.c. ampoules of soft glass, and the ampoules are sealed in the flame. The specimens are then shipped under refrigeration to the laboratory in which the tests are to be made. A moderate amount of haemolysis does not interfere with the test.

In making the test 3 c.c. of each serum to be tested is placed in a test-tube. A known immune serum and a known non-immune serum are used as controls. To this amount of serum is added 1.5 c.c. of a 20 per cent. suspension of mouse brain containing the fixed yellow fever virus. Susceptible white mice are anesthetized with ether. Each mouse is given an intracerebral injection of sterile, two per cent. starch solution to localise the virus in the brain, and an intraperitoneal injection of 0.6 c.c. of the serum-virus mixture. Six mice are inoculated with each mixture. The mice that die from

five to ten days after inoculation are assumed to have died of yellow fever if the results with the control animals that received known sera with virus are satisfactory. If all the mice in a group of six survive, or all but one, the specimen of serum tested is considered to have protective power. If four or more of the six mice die within the same period, the serum is reported as giving no protection. Intermediate results are classed as inconclusive. Further details are given in the original description of the method (Sawyer and Lloyd, Jour. Exper. Med., 1931, Vol. 54, p. 533).

The protection test surveys, although incomplete, have already given us evidence which has somewhat modified our views on the distribution and epidemiology of yellow fever in Africa. In only a few extensive regions within the areas studied does the evidence tend to show that there has been no yellow fever within the life of the present generation. Such areas are, for example, French Niger far north from the Nigerian border and towns on the Niger River in the eastern part of French Soudan. Here and there in Nigeria and Gold Coast are towns which have been free or almost free from infection. In most towns investigated, however, there have evidently been a considerable number of cases of yellow fever, and these towns are widely scattered throughout the region studied. In some of the towns, and even in a few of the cities in which permanent endemicity was suspected, few or none of the children have protective sera, although many of the adults are immune. We can interpret this as showing that the principal immunizing epidemics occurred before these children were born. In other places the percentages of immune persons are similar in children and adults, and it is concluded from this that yellow fever has been present in recent years. It may be difficult to decide, without the help of a history of local epidemics, whether the yellow fever in such a place is to be classed as endemic, intermittently epidemic or epidemic with long period of complete absence. The percentage of immunes varies greatly between the different towns, but in no instance have all the persons tested been found to be immune.

From the above it seems that there are relatively few places which can be classified as permanent endemic foci, like Havana of old, and that it would be difficult to prove that even the largest cities are continuously endemic over long period of time, although the absence of observed epidemics would support the belief that they are. It would seem also that the great reservoir of yellow fever in West Africa is composed principally of numerous epidemics which come and go in native towns. In each outbreak children and adults are involved in proportion to the extent that persons in these age groups have been previously immunised, and that depends largely on the interval since the last immunizing epidemic. It seems clear that the human reservoir contains numerous adults as well as children, during their brief infective period, and that a considerable proportion of both escape infection even in cities which are possibly permanent endemic foci.

From the historical records and the immunity surveys it would appear that yellow fever has been present in many communities scattered over West Africa from the northern border of Senegal to the eastern border of Nigeria. It should be kept in mind, however, that this observation is based on the sum of the experiences of a long period of time and that the picture would seem quite different if we could recognise and consider separately the actual infections with yellow fever during the present year. It would be a mistake to consider the revelations of the immunity survey as evidence of a recent extension of yellow fever and an increased danger. It is our understanding of the disease rather than the disease itself that is increasing, and fuller knowledge should be an added safeguard. Moreover at the present moment outbreaks of yellow fever seem to be fewer than usual. Freetown seems to have kept itself uninfected for many years and control work is going on in a number of other important seaports. It must be admitted, however, that the recent studies have removed all hope of the early eradication of yellow fever from West Africa. Unfortunately the perpetuation of the disease does not seem to depend entirely on a very few endemic centres which could be sought out and controlled by an intensive anti-mosquito campaign. It will probably be necessary to await a broad advance in sanitation and the installation of piped water supplies in the cities and towns before the eradication of yellow fever can be considered. In the meanwhile it is of the greatest importance that the seaports and airports and all other key places should be kept under control, and that the wanderings of the disease should be closely watched.

#### *The Barriers against the Spread of Yellow Fever.*

How great is the danger of the extension of yellow fever from West Africa to East Africa and from there to the Orient? It seems highly probable that both these regions are infectible. The mosquito vector, *Aedes aegypti*, is present. Indian and Javanese strains of this species have been shown to be capable of transmitting yellow fever to monkeys by biting (Hindle, E., Trans. Roy. Soc. Trop. Med. and Hyg., 1929, Vol. 22, p. 405. Dinger, J. E., Arch. f. Schiffsn. Tropenhyg., 1929, Vol. 33, Supplement 3, p. 83). Natives of India are susceptible, for Indian labourers in South America have died of the disease. Daniel Blair reported on an epidemic in British Guiana in 1856 and gave the numbers of cases and deaths in natives of India. The mortality among the Indians was about the same as that among seamen and resident Europeans. Whether the East African negroes would differ from those in West Africa in the degree of their susceptibility to infection with yellow fever or their power to resist the effects of the disease, we do not know. The hope that parts of the Orient in which dengue is prevalent might be non-infectible because of cross-immunity between yellow fever and dengue has been taken away by the recent observation of Stefano-

poula and Callinicos that the sera of eleven persons who had recovered from dengue would not protect mice against yellow fever virus (Stefanopoulo, G., and Callinicos, G., *Comptes red. Soc. Biol.*, 1932, Vol. 110, p. 1230).

Since East Africa and parts of South Africa are in all probability infectible, it is important to study the barriers which have protected these regions from invasion during centuries past. The ocean barrier was highly inefficient in the days of the slave trade, when sailing vessels with larva-infested water butts carried yellow fever back and forth between Africa and the Americas. The voyage by the longer and less frequented route around to the eastern coast of Africa do not seem to have transplanted the infection. Even now the coastwise shipping may be a factor in the waves of yellow fever which occasionally occur in West Africa and involve a number of ports. The ocean barrier needs constantly to be re-inforced by the rigid suppression of mosquito breeding in ports and on ships.

The barrier to the north of the infected region is a wide band of arid country with a small population, including Mauritania and the Sahara Desert. This barrier has been highly effective in preventing the spread of yellow fever northward. Nevertheless the disease not infrequently approaches the southern fringes of this arid belt, and Johnson has concluded, on the basis of the studies and experience in Nigeria, that the dry northern country is infectible and able to maintain the infection throughout the year (Johnson, W. B., *Brit. Med. Jour.*, Aug. 13, 1932—285).

The barrier to the south is difficult to discuss because we do not yet know how far the infected region extend to the south and east of Nigeria. Plans are being made for an immunity survey of parts of French Equatorial Africa and the French Cameroons by governmental health officials and the West African Yellow Fever Commission of the Rockefeller Foundation. Arrangements have been made also for a similar study in the Belgian Congo. There the blood specimens will be collected by governmental health officials and sent to the Commission's laboratory in Lagos for examination. It is hoped that a survey can be made in Angola also. Pending the results of these investigations we have only the published reports of outbreaks to guide us. As has been previously mentioned, yellow fever has been reported as far south as Angola. Near the southern boundary of Angola and in the northern part of South-West Africa there is a region of low rainfall and sparse population which extends far into the interior. It would tend to retard the advance of yellow fever if the disease should be found in the Congo region or northern Angola.

The obvious barrier on the east is the high and mountainous lake region separating the Congo basin from East Africa. A study of the climatic factors which might inhibit the breeding of *Aedes aegypti* in this region and a survey of the prevalence of these mos-



quitos in populous places and along routes of travel would give most useful information. It seems improbable that the well-watered equatorial forests of French Equatorial Africa and Belgian Congo, from which yellow fever has never been reported except near the coast, is unfavourable to the spread of yellow fever where the population is adequate. Unknown factors may exist, nevertheless, and a study of the density of *Aedes aegypti* and the customs of the natives with regard to water storage would be valuable. The region on the boundary between French Equatorial Africa and the Anglo-Egyptian Sudan requires investigation, particularly with regard to the prevalence of the mosquito vector in relation to the density of population.

#### *Observations bearing on Methods of Control.*

In the days before it was known that yellow fever was transmitted by a mosquito, quarantine played the dominant role in yellow fever control. The main reliance is now placed on the prevention of mosquito breeding in the cities and towns in strategic positions and keeping them non-infectible. Mosquito control remains the most effective of the weapons against the introduction or spread of yellow fever. The method involves the systematic inspection of all houses by trained inspectors for the purpose of discovering and eliminating the breeding places of *Aedes aegypti*.

A number of recent observations have given us a better understanding of the insect vector. Although the common stegomyia, *Aedes aegypti*, seems to be the only vector which needs ordinarily to be considered in yellow fever control, several other mosquitoes have been shown to be capable of transmitting the infection by biting. The possibility of transmission by these other vectors should be kept in mind by persons investigating outbreaks under unusual circumstances, particularly if the common stegomyia does not seem to be sufficiently numerous to account for the presence of the disease.

The incubation period of yellow fever virus in the mosquito may be markedly shortened by keeping the insect at abnormally high temperatures. Davis has found that *Aedes aegypti* may become infective in four days after its infecting blood meal if kept continuously at 37° C., but that it is non-infective after nine days and infective after eleven days if kept at tropical room temperature averaging 23-4° C. At 21° C., infectivity appeared after 18 days (Davis, N. G., Am. Jour. Hyg. 1932, Vol. 16, p. 163).

Experiments by Frohisher, Davis and Shannon have shown that a large colony of mosquitoes cannot maintain yellow fever virus for a time longer than the average maximum life span of the mosquitoes if they have no opportunity to bite an infected animal for person. (Frohisher, Davis and Shannon, Am. Journ. Hyg., 1931, Vol. 14, p. 142). It follows that mosquitoes do not maintain the virus for a considerable length of time by simply passing it from mosquito to mosquito.

There has been no discovery of an animal, other than man, that becomes infected with yellow fever under natural conditions and that may be acting as a reservoir of the virus, although several Asiatic and South American monkeys have been shown to be susceptible to yellow fever in laboratory experiments. The unusually long incubation period of ten days was observed in each of two cases of yellow fever studied by Low and Fairley (Low, G. C., and Fairley, N. H., Brit. Med. Jour., January 24, 1931). In one of these two cases the blood was shown to be infective by inoculation into a monkey as late as 89 hours ( $3\frac{3}{4}$  days) after the onset of the illness. The patients had been infected by contact with infective blood and not in the usual way through mosquito bites. In quarantine practice the maximum incubation period is still taken as six days from the infecting bite, and a long experience suggests that this is reasonably safe.

The possibility that improved methods of travel, particularly by railway trains, motor vehicles, and air craft, might carry yellow fever through barriers heretofore effective, has caused considerable concern. As yet there has been no evidence that yellow fever has been carried by aircraft in Central or South America. Some of the recent outbreaks in Brazil and Bolivia seem to have been the result of the introduction of non-immune persons, usually troops or refugees from a drought-stricken district, into a region in which most of the people were immune and the presence of a small amount of yellow fever was unrecognised. As soon as the disease becomes actively epidemic in a community and involves many cases, the number of infective mosquitoes and if infected persons travelling during the incubation period may be assumed to rise rapidly. This increase in the carriage of virus into surrounding communities puts a severe test on their resistance to invasion. Epidemics appear in towns which were free of infection or were quietly keeping up a partial immunity of their population by occasional unrecognised infections or small outbreaks. Such, it seems to me, is the explanation of the extension of yellow fever in Brazil during and after the recent epidemic in Rio de Janeiro, and of the appearance of a succession of epidemics in groups of African towns. Evidently the prevention of epidemics, especially in centres of travel, and the suppression of such outbreaks, when they have been allowed to occur, are essential measures for the protection of infectible places at a considerable distance. The infected territory cannot be expected to carry the whole burden, however, especially now that the extermination of the disease in Africa seems remote, and the vulnerable regions should protect themselves by making their key cities as nearly non-infectible as possible. In addition it would be wise to exercise a degree of control over rapid travel from infected to non-infected territory.

That *Aedes aegypti* may survive long flights in air planes has been demonstrated by Griffiths and Griffiths (Griffiths, T. H. D.,

and Griffiths, J. J., Pub. Health Reports, 1931, Vol. 46, p. 2775). They drew the conclusion that "with conditions at airports such as would permit of many mosquitoes getting abroad, it might be expected that approximately one-fifth of the original number would be transported for a long distance—at least 1,250 miles—in one day, with repeated landing and opening of doors, hatches and windows, and refuelling, unloading, and loading taking place." They were of the opinion that there is no obstacle to the efficient treatment of airplanes so as to destroy mosquitoes. The risk of carrying persons in the incubation period of yellow fever seemed to be of greater importance than the transfer of infected mosquitoes.

The diagnosis in suspected cases of yellow fever still rests largely on the symptoms. When an accurate diagnosis or its confirmation is of great importance and a yellow fever laboratory is near, it may be possible to carry the infection into a rhesus monkey by inoculation of blood drawn during the first three days of the illness and to recover the virus and prove its identity. As such blood may contain the virus it is necessary to handle it with great care and avoid sending it to laboratories where the introduction of the virus would be dangerous or is prohibited by law. A more time consuming but safer procedure often gives evidence of value. Blood is drawn at least two weeks after the beginning of the attack, and 10 c.c. of the serum is sent to a laboratory for testing in mice for protective antibodies. If the serum gives no protection, yellow fever may be ruled out. The presence of protective power would indicate that either the observed attack or an earlier one was yellow fever. The serum may be tested also, using guinea pigs, for its power to protect against *Leptospira icterohæmorrhagicæ*, the infectious agent of Weil's disease, which may easily be confused with yellow fever. There are unfortunately other infections which are characterised by jaundice and which may resemble yellow fever and for which we have no specific laboratory tests.

It is now possible to vaccinate small numbers of people against yellow fever with reasonable safety and obtain a high degree of immunity. The method consists of injecting a specified amount of tested immune human serum subcutaneously in the abdomen and soon thereafter giving a small injection of yellow fever virus fixed for mice subcutaneously in the arm. (Sawver, Kitchen and Lloyd, Jour. Exper. Med., 1932, Vol. 55, p. 945.) During over 200 passages in mice this virus has almost entirely lost its power to produce illness in monkey inoculated subcutaneously or intraperitoneally. Although disease is not produced in the vaccinated persons, a high degree of immunity develops in the course of two or three weeks. The first ten persons vaccinated in our laboratory were tested one year later, and in each instance the serum was found to have definite protective power.

There are distinct limitations to the application of the method of vaccination. In the first place, the virus cannot be used in any

country into which the introduction of living virus would be dangerous or has been prohibited. In the second place, it would be difficult to secure enough immune human serum from recovered or vaccinated persons to satisfy a large demand. A beginning has been made by vaccinating persons who desire protection against unusual exposure; for example, those who are actively investigating yellow fever in the field or in the laboratory. It seems probable that vaccination may be useful for the crews of airplanes making stops in infected regions and may be desired by certain travellers if they can thereby avoid quarantine restrictions placed on non-immunes. To determine whether a person is immune it is only necessary to send 10 c.c. of his serum to a laboratory in which protection tests in mice are made.

You will probably agree with me that protective measures against yellow fever in Africa must be based on a full knowledge of the situation if they are to be effective. The Office International d'Hygiene Publique has urged the extension of the present immunity survey to other regions of Africa. I have mentioned the plans for Belgian Congo and French Equatorial Africa. In East Africa it would seem advisable to confirm the supposition that the region is entirely free of infection by taking serum samples from natives in a few representative centres. Health officials in the British Crown Colonies who wish to participate in such an immunity survey can arrange for the laboratory tests through Dr. G. M. Findlay and should send the blood specimens to him at the Wellcome Research Institute in London. He will decide whether to make the tests there or send the specimens on to the yellow fever laboratory in New York.

Many of us are interested in yellow fever in Africa. If we push the investigations and pool the information acquired, and meet together like this from time to time, I am sure we shall find a solution for our difficult problem."

Sir E. Thornton having taken the chair, Sir Geo. Buchanan then gave an exposé on the yellow fever problem from the point of view of air craft and its regulation by means of a convention. Sir George had circulated: (a) copy of the aerial Navigation Sanitary Convention, (b) copy of a note prepared by him for the October meeting of the Health Committee of the League of Nations at Geneva on the Cape Town Conference and its scope (L. of N. C. H. 1107 App. No. 1), (c) an English translation of the report by the Yellow Fever Commission of the Office International d'Hygiene Publique as adopted by the plenary session at its October 1932 meeting (*vide* App. 2).

He read extracts from L. of N. C. H. 1107, took up the various provisions of the Convention article by article and explained them. He showed how this air craft yellow fever problem had not got a

parallel in shipping and he quoted from Dr. Sawyer's report as follows:—

"During the last 30 years it has been repeatedly proved in practice that control and elimination can be successfully and speedily accomplished if action is taken in accordance with the basic observations that yellow fever is transmitted only from actual human cases in the first three days of the attack, that the incubation period of new cases does not exceed six days, that the agent of transmission is a domestic mosquito which remains in or in the immediate vicinity of, the house where it has fed, and that the insect, after feeding upon an infected case must survive for 12 days or more before it can transmit the virus to another person. A good deal has been written lately about the wide 'range of dispersal' and power of flight of the yellow fever mosquito as estimated by field experiments under artificial conditions, but for the purposes of practical sanitation, it is more important to know that yellow fever has never been conveyed by mosquitoes many yards from an infected house. The late Senior Surgeon H. R. Carter, whose epidemiological experience of yellow fever was unrivalled, wrote on this point: 'I think it is fair to say that yellow fever will rarely be conveyed by mosquitoes 100 yards'."

Sir George's exposé elicited at once a series of questions from most of the African delegates to most of whom the contents of the draft Convention were new. I have endeavoured to summarise briefly the gist of the more important of these questions (*vide* Annexure 11).

#### November 17th, Forenoon.

As a result of the above-mentioned discussion the impression had been conveyed to many of the delegates that, in the creation of anti-amaryl aerodromes in accordance with the provisions of the draft convention, the essential desideratum was to carry out the spirit and not the letter of the convention. This was brought home to me in various conversations during the evening of the 16th November with the result that I saw Sir George Buchanan regarding it and suggested that it would be very unfortunate from the point of view of a country like India if such an impression were allowed to emanate from the Conference. He agreed to open the next meeting on November 17th by clarifying the point and this he did. He made it abundantly clear that signatories would be morally bound to carry out the provisions in letter as well as in spirit with due regard to local circumstances. His remarks will be found on pages 50-54 (Appendix 6). I said that, to my mind, it would have been unfortunate if the impression had gone out from this Conference that, when a country accepted the Convention in spirit this meant that it could pretty well do as it liked in the construction of an anti-amaryl

aerodrome. Countries like India regarded East African states as "buffers". If it came to be known in the Far East that it was the opinion of this Conference, that they should be accepting this thing in the spirit only, it would have been peculiarly unfortunate. I thanked the Chairman for clearing the position; and Sir E. Thornton endorsed what I had said.

Dr. Duff of Accra then read his note on his experiences of yellow fever control on the Gold Coast and the present situation there and was congratulated by Chairman on his contribution. This led to a series of questions which I have again briefly tabulated in the form of question and answer (*vide* Annexure 12).

# "A NOTE ON YELLOW FEVER CONTROL IN THE GOLD COAST AND THE PRESENT SITUATION. BY DR. DUFF.

## A.—PRELIMINARY.

In this note I will summarise as briefly as possible my experience of yellow fever control on the Gold Coast, stating what the main lines of our practice are and what we have already achieved. Much of what follows must already be known to delegates, but some may care to hear such a résumé as this.

The discovery in 1900 that the *Stegomyia* mosquito (now known as the *Aedes argenteus* or *aegypti*) was the ordinary carrier of yellow fever led at once to a certain amount of control, but really serious efforts were not made until 1910. I myself saw the beginning of this work and have followed it carefully up to date. In the first week of May, 1910, an outbreak began in Freetown, Sierra Leone, and between then and the first week in August a series of severe cases occurred, with a heavy mortality rate. Ten adult cases in all were noted (5 Syrians, 4 Europeans and 1 African), all of whom died except 1 European. There was only one female in this series—a Syrian.

In April of the same year an outbreak began on the Gold Coast at Sekondi, with a similar heavy mortality rate—10 European and 2 African cases, with 11 deaths. The only recovery was a European female—the one female of the group. At Axim, a small timber port to the west of Sekondi and at Saw Mills Camp, 12½ miles inland on the Sekondi-Kumasi Railway independent so-called 'sporadic' cases occurred. I shall refer later to the use of the word 'sporadic' in connection with yellow fever.

These outbreaks caused considerable alarm at the time and Sir Rubert Boyce, at the request of the Colonial Office, proceeded to West Africa to investigate the subject on the spot. He sailed from England on the 1st June, 1910, and was accompanied by several young medical officers who had recently been appointed to the West African medical staff. Two disembarked for duty at Freetown and six others (of whom I was one) went on with Boyce

to Sekondi, to assist him in any work which he proposed to do. We landed about the middle of June, and found that the outbreak had been brought to a speedy end by the energetic action of Dr. Rice—the head of the Sanitary Branch of the Gold Coast Medical Department. Our work was to re-fumigate infected and other bungalows, and to press on with the general anti-mosquito measures, which had all been intensified. We all worked very hard and were familiarly known at the time as the “Yellow Perils”.

In December of the same year Boyce, who had completed his investigations, published his work “Yellow Fever and its Prevention”. His object was to furnish a text-book on yellow fever for the use of medical officers working in West Africa. In this book he summarised his own experiences and observations in New Orleans and Central America in 1905, in the West Indies in 1909, and in British West Africa in 1910. He laid special stress on the subject of yellow fever as it appeared in West Africa and on the need for vigorous and continued action. Simple and clear directions for control, based on the fundamental work of the American Commission of 1900-01, were enunciated and a mass of most valuable information collected. I know of no single publication on the subject so helpful to a Medical Officer or Medical Officer of Health working even to-day in West Africa.

One statement by Boyce in his book provoked a considerable amount of controversy at the time, viz., “The African native is as saturated with yellow fever as he is with malaria, and his escape from severe yellow fever and its very frequent occurrence amongst the whites is proof of the contention” (page 259).

It was not—as we now know—entirely just to compare yellow fever with malaria, or to use such a word as “saturated”. The diseases cannot well be compared. Boyce's object, however, was to emphasise his own opinion that a considerable amount of mild yellow fever was going on unrecognised amongst natives (especially children), and that really effective control measures should be pressed forward. He held that much of what was then called “remittent” and “bilious remittent” fever, and attributed to the malarial parasite, was in reality true yellow fever and would disappear with the destruction of the *Stegomyia*.

Another object he had definitely in view was to encourage early diagnosis and notification of the disease by medical men, and to break down what he called “notification fear”. He insisted in and out of season on the public danger of any “ostrich” or “hush-hush” policy in dealing with yellow fever. When I assumed duty on the Gold Coast there was a reluctance on the part of the administrative authorities to admit the presence of the disease is a centre, owing to the panic liable to arise, and to the interference with trade and commercial interests which would follow on the quarantine measures which then used to be taken. He urged that the joint effect of failure on the part of individual medical men to be on the alert for and to report every case, or

even suspected case, and of failure on the part of the administration to admit freely the possible presence of the disease and to encourage such reports, was against the best interests of the public health and might easily be disastrous. Boyce's efforts have been most fruitful and a "hush-hush" policy has long ago been abandoned on the Gold Coast as indefensible.

#### B.—ACTUAL CONTROL MEASURES.

I now come to the measures ordinarily employed for control. For practical purposes these may be divided into—

- (i) Routine measures in constant use;
  - (ii) Emergency measures during an outbreak.
- (i) Routine measures resolve themselves into—
- (a) Mosquito destruction in the ports and all the larger towns, and beyond these areas where we can place reliable sanitary staff.
  - (b) Segregation of susceptibles (Europeans) in residential areas with a building-free zone of at least 440 yards from the native town and the enforcement of very special rules for these areas.
  - (c) A constant watch by all medical officers for cases of the disease, mild or otherwise, and the collection and dissemination to all stations of information concerning such cases.
- (ii) Emergency measures include—
- (a) Intensification—especially at a focus of outbreak of the routine anti-mosquito campaign. *It is assumed as a working rule, that when a recognisable case occurs, an outbreak is going on somewhere in a mild unrecognisable form, and that a genuinely "sporadic" case cannot really occur.*
  - (b) Proclamation by law of "infected areas" in order to obtain emergency powers for the sanitary authority.
  - (c) Temporary evacuation, if necessary, of susceptibles from such areas.
  - (d) Isolation and careful screening of cases, and fumigation of houses where such cases have occurred.

By far and away the most important of all these measures is the destruction of mosquitoes by anti-larval measures. Constant war against the *Stegomyia* must and does go on. The major portion of our effort is directed to keeping the "house" index for larvæ as low as possible. Fortunately the habits of the *Stegomyia* are well known and, provided the necessary efforts are kept up, breeding can be comparatively easily controlled. Any remissness of effort in this respect is regarded as a sanitary sin. The *Stegomyia* is regarded as essentially the *domestic* mosquito, breed-



ing almost entirely in artificial containers of uncovered standing water *in and around houses*, and living in close association with man. It is quite possible, therefore, in every important civilised centre with a sanitary staff to apply larval control in conjunction with other general public health measures.

### *Application of Methods.*

(i) *Piped water supplies*—*The chief centres* : The introduction of a piped water supply has been found to be the most effective single measure which can be applied to a town to limit breeding. The need for storing water in tanks, barrels or cisterns which require careful screening and constant attention, or for hoarding it in water pots, jars, etc., in the corners of a dwelling, ceases at once. Roof-gutters leading to storage, tend to sag and to hold water, and need to be carefully graded and perforated. When a piped supply is installed, these can be removed. Filthy surface-wells can be filled in. etc., etc. Our important ports have now piped supplies and in a short time our larger inland centres will have the same.

(ii) *Important centres without piped supplies* : In these the ordinary methods of screening stored water, etc., are still carried on. Much of the time of our sanitary staff in such places is devoted to the supervision of water-supplies. Tanks, barrels, cisterns, etc., must be screened and attended to, roof-gutters graded and perforated, etc., etc. The task is a heavy one, but it is in places such as these and in the larger villages that the disease is most likely to persist.

Financial resources do not permit the employment of a large enough staff to achieve in the outlying villages the same high standard of control which is possible in the larger centres, but at the same time every effort is being made to bring home to the people the desirability of keeping down the numbers of *Stegomyia*—and not without a measure of success. Progress, to be lasting, depends ultimately on the advance of education and enlightenment, and this is bound to be a slow process.

(iii) *In all important places* : In addition to the above primary measures, certain accessory measures are employed. Apart from the large water-containers for the normal supply of dwelling, regular attention must be given to all water-holding receptacles which might possibly constitute breeding-places (flower vases, ant-guards, etc.). All tins, bottles, calabashes, coconut shells, old crockery, etc., must be regularly removed by the house-holder to the dustbin, from which they are removed by the sanitary squads for ultimate disposal by burial or destruction. Rot-holes in trees, hollows in rocks, and various unusual breeding-places must be sought out and dealt with. At times, as need arises, other methods such as the kerosening of defective drains or of collections which cannot be covered, drainage or filling-in of certain collections of water, stocking with fish, etc., may be employed. Of accessory methods, the

removal of rank grass, weeds, shrubs, etc., and the general clearance of bush for a wide area around habitations and villages has proved a measure of the greatest importance and value. The results of putting an end to the indiscriminate throwing-out of old tins, bottles, etc., or other rubbish—which may remain concealed and form breeding centres—are most beneficial.

(iv) *Staff*: An active staff of trained inspectors, backed up by clear laws which can be firmly enforced against all classes, is essential. This exists at all the large centres. All opposition to the activities of the staff must be fought strenuously.

(v) *Segregation*: When I assumed duty on the Gold Coast in 1910, the majority of Europeans belonging to the mercantile community lived over their business premises, which were situated in the heart of the native towns. As a result, they suffered far more severely than officials from yellow fever and other illnesses. In 1908 Government took steps to encourage merchants and non-officials to live outside of the native towns, by offering land on easy terms for the erection of bungalows on approved plans.

At first few firms took advantage of this offer, but by now they have learned the wisdom of segregation—so much so that there is now little difference in the invaliding and mortality rates between officials and non-officials. This excellent result is, no doubt, due in part also to the other routine measures in force.

Syrians, however, still prefer to live in the native towns. As a result, they still suffer considerably from various illnesses. They are often the first to be attacked if yellow fever breaks out, and thus furnish an indication of the presence of the disease.

(vi) *Notification—Early diagnosis, etc.*: I have already referred to the fact that at the beginning of an outbreak well-marked cases are rare, whilst milder types predominate. Another fact is that the disease displays a peculiar tendency to break out simultaneously, and apparently independently, in different places. These facts are of the very highest importance from the point of view of control.

I have touched on the former reluctance to admit, or even in some instances the conspiracy to deny, the presence of the disease when reported. On the Gold Coast this evil phase has completely passed. Every medical officer is encouraged to study closely the clinical manifestations of the disease, and to have constantly in mind the possibility of its occurrence—especially if *stegomyias* are at all numerous in his area. He is encouraged to notify, *without hesitation, every suspicious case*. The clinical diagnosis of mild cases is extremely difficult, and a medical officer is not criticised adversely should he diagnose as yellow fever a case which subsequently proves to be something else. Quite the reverse. It is felt that he has acted on the "SAFETY FIRST" motto, and in the very best interests of the public. The result of a notification is that a senior officer proceeds with speed to the spot in order to assist the junior officer in the case. Every step necessary is taken

to verify diagnosis. Blood is collected and sent in ice to Lagos, to the Rockefeller Foundation Laboratory. If death occurs, post-mortem specimens of liver, kidney, etc., are collected for sectioning. If a suspected case turns out to be positive, telegrams are despatched from the central office to all stations. Anti-mosquito measures are then intensified everywhere, in order that chance of spread may be limited. Other Administrations in West Africa are at once notified by cable. The really important point to note is that there is now *no concealment* whatever. In the old days the French used to blame the British especially for their reluctance to admit the presence of yellow fever in their territories.

Connected with this open policy is the gradual recognition by intelligent Africans that it is in the interest of themselves to support the Administration in its efforts. Formerly there was a disposition to believe that the measures directed to the destruction of mosquitoes were intended for the benefit of Europeans only, but on the Gold Coast it is gradually coming to be recognised by Africans that although Europeans do suffer from the disease more severely than Africans, nevertheless Africans *can* suffer and die from it, and that in their own interests an attitude of apathy or opposition, active or passive, is not justified. We have, of course, those who are inclined to be suspicious of everything Government does, and to raise political or colour questions if they can, but in my opinion such individuals are becoming fewer every day. The African has now great confidence in, and respect for, European medicine and medical men, and the progress we have made, as evidenced by a steadily lessened opposition to anti-larval measures, is due in a large measure to this confidence and respect.

#### C.—ACHIEVEMENT.

With the staff at our disposal and with our present financial resources, it is not possible to sanitise fully or to "mosquito-control" every village on the Gold Coast. Such an aim would be quite impracticable, but it is possible to achieve, and we do actually achieve, a considerable measure of control in all the large centres, and especially in the seaports.

The monthly "larval index" is taken as our practical working measure of control. By this I mean what O'Connor calls the "house index", namely, the *ratio* of houses or compounds found infested with larvae (*i.e.*, found on routine inspections to have one or more water receptacles with mosquito larvae) to all the houses inspected. Each town under control is divided into wards for the purpose. All larvae found in fresh water-containers in or near a house are, for practical purpose, regarded as *stegomyia*, but at regular intervals a certain number of specimens are set aside to breed out. Monthly returns, controlled by a check made by European inspection, are prepared and forwarded to headquarters. Boyce held that in towns where the index was 100 per cent., yellow fever could be assumed to be endemic; where it was 10 per cent.

or below, it could be assumed to be not endemic, below 5 per cent. a few so-called "sporadic" cases might occur, but no serious spread. Our efforts are directed to keeping the index well below 5 per cent. 1 per cent. or 2 per cent. is not uncommonly returned, but any approach to 5 per cent. or over is, in practice, taken as a signal for enquiry and action. Where enquiry is required, it almost always proves in practice that inspection has been slackening.

A very striking fact is that in no centre in which segregation combined with mosquito control has been practised, has yellow fever broken out in the area of segregation. This, to my mind, is conclusive proof of the possibility of strict control of yellow fever in any area desired. True, an outbreak did take place in Tamale in 1931, but residential areas in that town with building-free zones had not been correctly delimited then, an unsafe number of native dwellings had been permitted to remain in close proximity to European dwellings, a pipe-borne water supply had not been installed, and the general sanitary position was not satisfactory. Steps have since been taken to remedy all these points, and further serious trouble is unlikely. I should mention that from all controlled residential areas African children are rigorously excluded at all times, and only those natives who are personal servants of the occupiers of a house are allowed to sleep in the area.

I think that little more can be done than we are now doing on lines of mosquito control. It is recognised that the price of immunity from attack by yellow fever is an unceasing war on the *stegomyia* mosquito. We have to contend with careless and obstructive householders, careless or lazy or deceitful inspectors—and even when the greatest care is taken it is possible to overlook and miss small collections of water which may be breeding mosquitoes freely.

I do not look forward to the complete elimination of yellow fever from the Gold Coast. The masses in the outlying villages are still too ignorant and careless; the area to be dealt with is too large to be effectively covered by our supervising staff, but we can keep the strategic centres clean, and we can keep the segregation areas for Europeans very clean. Conditions to-day are vastly better everywhere than they were in 1910, when I first came to West Africa, and as time goes on further progress should certainly be possible.

#### D.—THE NEW KNOWLEDGE.

It will be seen from the above that I have made no reference to the recent work of the Rockefeller Foundation and the great advances in knowledge which have been made, but have limited my remarks to well-tried and well-understood control methods. Although great things are expected from Dr. Sawyer's protective vaccination and the new weapon is bound to be of tremendous value, we must, I think, still continue the war against the insect vector as vigorously as ever—and this not alone as a special anti-yellow fever measure, but as part of the general war against

all forms of filth and vermin. I have no doubt that those countries of Africa in which yellow fever is non-endemic will applaud such endeavours. In taking the steps we do, we admit that we are acting primarily in our own interest, but we recognise at the same time a duty to our neighbours. Hitherto we had considered only our immediate neighbours on the West Coast, but we must now think of those further afield. But is it fair to expect that the whole burden of effort should be borne by the countries in which yellow fever is endemic? I have no personal knowledge of East African conditions—I hope to pay a flying visit to Kenya and Uganda after this Conference. The opening-up of land routes suitable for motor travel throughout tropical Africa, is bound to facilitate the spread of infectious disease. The African is everywhere a great traveller. It will not be easy to control all his comings and goings. Why yellow fever has not already reached East Africa would seem to need complete explanation.

#### E.—AIR TRANSPORT.

From this note I hope I have made it clear that it is in my opinion quite possible so to control specialised areas in West Africa that yellow fever may be completely eliminated from them. Such areas already exist in our official residential areas. There is no difficulty in so siting an aerodrome, and in controlling sanitary conditions in and around it, that the chances of taking on board an infected mosquito are almost *nil*. The de-insectisation of an aeroplane before departure is also a simple measure.

The chances of a human being who may be incubating yellow fever being taken on board is a much more likely possibility, but as Dr. Johnson\* has suggested, air services from West Africa are for some time likely to be limited and to be used almost exclusively by Europeans. On the despatching side it would be quite feasible to secure that passengers and crew should dwell in a residential or other well-controlled area for six days before departure, and to issue medical certificates to this effect. Immunisation of crews and passengers (Sawyer's method which may be improved as time goes on), with certification, would appear to be a possible routine measure before very long, and the receiving country could insist on this measure. Action on such lines by a despatching country could reduce the risk of yellow fever being carried by aircraft to zero. I have already ventured the opinion that the risk of the introduction of the disease to East Africa, by land is probably greater than it is by air. The Administrations there should, I think, for this reason alone, turn their attention very closely to their position with regard to *stegomyia* control, and how they are prepared to meet the threat of an advance of the disease by land as well as by air.

D. DUFF."

Cape Town, November 1932.

\* B. M. J., August 13th, 1932—page 285: "Recent Advances in the Knowledge of Yellow Fever."

All delegates were now asked to make any statement they cared to regarding item V (d) (ii) of the Agenda.

As these represent the position of each of the " so-called " buffer states between India and the infected areas, I have set down the statements in some detail as being of special interest to the Government of India.

(1) *Northern Rhodesia (Dr. Mactennan)*: Route to Madagascar will be through part of Northern Rhodesia. There are two main aerodromes on Imperial airways route-Cape-Cairo-one at Impika one at Broken Hill (see map). As the administrative headquarters is probably moving from Livingstone to Usaka, it is proposed to move the Broken Hill aerodrome there and make it a sanitary aerodrome. There will be one sanitary aerodrome in N. Rhodesia.

(2) *Angola—Portuguese West (Dr. Damas Mora)*: After giving a résumé regarding yellow fever in Angola he said that it was now uninfected though infectible. Because of financial position air route construction had been dropped and only refuelling stations now existed. They were therefore in a very favourable position to make new arrangements. In the case of forced descents the air craft was kept under surveillance. Stegomyia were few and easily controlled.

(3) *Mocambique—Portuguese East (Dr. de Sousa)*: At present no air routes existed and French line to Madagascar had been postponed on financial grounds. He thought International Air Sanitary Convention of 1932 should be a model if and when this route goes through. Stegomyia control existed in all the principal ports.

(4) *Kenya (Dr. Gilks)*: There is no direct contact by air between East and West. A route is projected North of Lake Victoria which will bring yellow fever areas close; but it is unlikely that this route will come direct to Uganda or Kenya as between them there is 400 miles of the Ituri forest. With increased transport facilities yellow fever areas are coming unpleasantly near. There would be no difficulty in providing a sanitary aerodrome which would probably be at Kisumu (for Kenya and Uganda) where are a medical officer, sanitary inspector, hospital (screened) and most of essentials as laid down in the Convention. He emphasised the danger of road spread; but pointed out that spread in Kenya might be limited by absence of native towns and by the way the people lived in the open in their own compounds where there was no attempt to control mosquito breeding.

Though in towns piped water supply existed to European houses this did not eliminate water-storage, e.g., Coast Arab houses had still many tanks. Sanitary inspection was fairly efficient and inspectors were all European.

Mombasa—the port—is modern; ships come alongside; port area is very carefully controlled and mosquitoes are efficiently dealt with, native catchers being efficient in the towns. They concen-

trate in "estates" on malaria anophelines and *not* on stegomyia though both come into the picture. The country is fairly dry.

Main sheet anchor is education leading to improvement in housing.

Asked how much the road service was developing, *e.g.*, for tourist traffic, he said that at present there was no traffic though four months ago he was able to go from the Uganda border to Stanley Ville in  $2\frac{1}{2}$  days and from there to the West Coast in one day—total  $3\frac{1}{2}$  days. A new road was developing South of the Mountains of the Moon. The "reserves" are practically untouched sanitarily.

(5) *Uganda (Dr. Lec)*: There were no trunk aerial routes and there was, meantime, no control of "aedes".

(6) *Bechuanaland Protectorate (Dr. Dyke)*: A sparse population with no European townships though some native ones. Stegomyia exist but on general survey has been done. As all South of the Zambesi are interested he suggested a mutual arrangement between Swaziland, Basutoland and Union of South Africa.

(7) *Basutoland (Dr. Nattle)*: No aerial flying allowed theoretically; but it cannot be stopped. Mosquitoes are very numerous. No survey has been done, information very incomplete.

(8) *Zanzibar (Dr. Smith)*: There are no big routes going through Zanzibar, the service being local only. Arrangements exist with Kenya and Tanganyika under Article 46, International Sanitary Convention, 1926.

(9) *South Rhodesia (Dr. Morris)*: Aviation has been developed here through the Beit trust by Imperial air ways and by a privately paid service to Nyasa and Beira. There are two customs aerodromes at Buluwayo and Salisbury and 14 other landing grounds, two being properly equipped.

Salisbury aerodrome—where one halts for the night—is  $1\frac{1}{2}$  miles from the town and  $\frac{1}{2}$  a mile from other habitations and near hospital and Government laboratory. This will be the sanitary aerodrome under the local authority. Most of the necessary things are on the ground now. Only a few stegomyia are present and he thinks that yellow fever cannot be introduced as things are at present. If, however, the French-Madagascar line developed it would open more possibilities of this.

He was keen to know what other States were doing. He saw difficulties in log-entries in cases of transshipment and thought a European sanitary inspector should be present who could telephone information, log books being faithfully transmitted. He thought there was no need to anticipate trouble.

(10) *South-West Africa (Dr. Hinsbeeck)*: There is a local service between Kimberley and Windhoek with one aerodrome and other landing grounds. The sanitary aerodrome would be sited probably at Walfisch Bay or Windhoek. No mosquito survey has been done. Neither Walfisch Bay nor Windhoek would be regard-

ed as potential yellow fever areas. At present Lagos Rockefeller laboratory has arranged to examine bloods from North and South of this area for protection evidence.

(11) *Tanganyika (Dr. Scott)*: They are separated by 1,600 miles still from yellow fever area; but preparations have been made on paper and the ground is covered. The problems are as follows (vide Appendix 7):—

- (i) *Transit of Mosquitoes*: *Aedes egypti* is universal and 19 other *Aedes* have been described some of which are potential vectors.
- (ii) *Protection test*: It was essential that this country should take an interest in yellow fever and in these tests.
- (iii) *Reduction of Aedes*: Cumming's paper on eradication of *Aedes*—by attacking breeding grounds and thus reducing stegomyia index—was quoted.
- (iv) *Spread*: Even assuming Tanganyika population susceptible, but protected by distance and lack of traffic, there is no apparent reason why it should not have spread by caravan traffic by introduction of infective material.
- (v) *Distance of yellow fever—West boundary*:—  
In 1928—1,200 miles.  
In 1931—1,600 miles.  
Therefore three days of observation needed after arrival from the ports.
- (vi) *Aedes in air craft* (natural and artificial): Summarised this question resolves itself into:
  - (i) serious danger of introduction by rapid transport including air craft,
  - (ii) control essential,
  - (iii) mosquito introduction unlikely,
  - (iv) piped water essential,
  - (v) as province is different from Kenya and with fewer Europeans, there is no difficulty about African sanitary inspectors—in districts 140 less highly trained Swahili speaking sanitary inspectors at present are working,
  - (vi) special searches needed for “mother” foci,
  - (vii) Bean crop conceals “aedes” receptacles and is therefore not a low growing enough crop. Sweet potatoes should be prohibited in townships because of the trenching being a source of “Gambia”.

(12) *Natal and Zululand (Dr. Park Ross)*: This is a potential yellow fever and dengue area. It has air services from (a) Rand, (b) Cape Town, (c) Lourenzo Marques. Dengue has caused serious outbreaks and cases in the town of Durban only. Control of yellow



fever in country area (especially Zululand) would be difficult, though it is possible in the towns. There is a constant stream of labour from Nyasaland through Portuguese East to Natal—and therefore co-ordination of intelligence work of Mozambique and Natal is essential. He feared yellow fever, if introduced, would creep into those areas and would be most difficult to control. There would be no difficulty in establishing sanitary aerodromes.

(13) *Union of South Africa (Sir E. Thornton)*: (i) Union Government was afraid of yellow fever especially after Sir Malcolm Watson's hot gossiping; hence such a conference was essential to precise the present position and danger.

(ii) Several well equipped aerodromes exist (e.g., Germiston) and these can be brought up to standard easily.

(iii) Importation of virus not prohibited in Union, but is done under licenses. Dr. Park in Natal would not perhaps get it but Sir Spencer Lister could arrange for this at the South African Medical Research Institute, Johannesburg.

*India's point of view—Major-General Graham's statement.*

"The point of view of India is not quite parallel to that of other countries whose representatives we have heard. When the Panama Canal was nearing completion the then Director-General of my service had thought very carefully of all this. We have on record at that period—about 1912-13—a survey of our major ports which was made. The conditions have not altered materially to-day from what was found at that particular time. We are a stegomyia ridden population. The minor ports are just as badly affected as the major ports. Major James who did this survey continued his work in Colombo and then went to Panama. After the outbreak of the great war everything more or less was upset; and, in the meantime, the Panama practical experience was arrived at that, in spite of the canal having opened, nothing happened, so we more or less lulled ourselves into a sense of security; after the war the matter received a new stimulus by development of this air traffic. Imperial Airways projected a route to Karachi; and the French followed up with the route through Burma to Indo-China and the Dutch with a route to Batavia. At this time this particular Convention you have before you was drafted. India has been considering this Convention from time to time through her delegation to the Office International. Incidentally, in addition to that, as you have heard she also considered the question of the importation of the virus. That was raised originally at Singapore and the Far Eastern Association of Tropical Medicine Congress in Bangkok. The matter then came before the Health Committee of the League and the "Office" in Paris. It was also considered in Europe: you have heard with what results, i.e., that various countries have prohibited it in various ways I wish to take up one particular article of the draft convention because I have been requested to put my Government's views before this conference. Article 48 was rather

a stumbling block with India in the first draft. My Government considered that the article did not give sufficient power to non-affected countries; and, as the result of discussions at the "Office" meeting in Paris in May 1931, a clause was inserted very largely at the instance of India and in order more or less to satisfy the position of India. The representative of India was asked to bring this again before the Yellow Fever Committee of the "Office"; and you will find an account of the discussion in the process-verbaux of the April-May session, 1932. The official interpretation of Article 48, I may say, went very far towards satisfying the Government of India; but, as you know, there have been various discussions since. I would remind you that we have a population in India of 351 millions and of that number 80 millions are living in Native States: so you must realise what a terrible thing it would be if, even though the disease were confined to the ports and the immediate hinterland, it arrived in a country like India. Some of the points which were troubling us have been pretty well disposed of at this Conference and I shall have great pleasure in telling my Government exactly what has happened here.

India's position prior to this Conference was that, while anxious in every way to avoid any interference with the completion and ratification of the international sanitary convention as you have it before you, they more or less felt that, in the light of available information, India should meanwhile adhere to the view that the prohibition of air traffic from yellow fever areas to susceptible areas is the only reliable safeguard. Now we have had this Conference: I have had the privilege during the voyage to Cape Town of talking about it to Sir George, Dr. Sawyer and also Dr. Duff. Since coming here I have heard Dr. Johnson; and, having read his paper to the British Medical Association in July 1932, I have gained a lot of information. Then I have had information from Dr. Orenstein and from all the various officers who have spoken on the position in regard to the non-affected African countries. The statements based on the practical experience of the disease behind all this have been to me invaluable.

We now come to what is going to be the position in regard to the future so far as my Government is concerned. As I have said my Government is not in any way against the inauguration of the convention. It attaches the greatest importance to securing some form of joint action on the part of the threatened countries of Africa. Risks to India would be greatly increased if the disease should spread to the East African countries: it is obvious that co-operation of effort is therefore very essential. If we have a chain with a series of links and one link gives way the chain breaks. You can therefore understand the anxiety with which India is looking at this question. It will give me great pleasure to place the results of this conference before my Government when I return in order to assist them in the consideration of the problem and in their future line of attack towards it."

Sir Edward Thornton asked if, as a result of this Conference, I was likely to advise my Government regarding the prohibition of the entry of virus into India? I said:

"I think we should be very unwise to do it. You have no conception of the great number of private laboratories that exist for all sorts of purposes. We do not know what they are doing; but I have not the slightest doubt that some of them would wish to experiment with yellow fever virus if they had the chance."

Dr. Johnson asked if any work against aedes was anticipated.

I replied that "We control mosquitoes from the malaria point of view. We have no special campaign against *Stegomyia*. What I should like to see would be that we get going on this and use this Conference as a lever towards setting up some organisation. We have a mosquito and malaria problem in some of our big ports. We have had to go into this mosquito question very thoroughly; but not from the view point of control of *aedes aegypti*."

Dr. Orenstein said: "I appreciate General Graham's point about the danger of these miscellaneous laboratories but could not consideration be given to the introduction of virus under licence? In a Government institution there would be no danger at all. I fear that the feeling might get out from this Conference that there is a real danger of the introduction and other people might follow suit and I think that would be unfortunate. I really do not want an answer to this; but I throw out the suggestion that in countries where there are laboratories which are not easily controlled they might consider the introduction under licence of such a virus in Government institutions in which they have confidence". I replied thus: "I have discussed this very carefully with the present Director-General. We were both agreed on the necessity for prohibition; but not from the point of view of any influences which had been brought to bear from outside. We came to this conclusion essentially on the merits of the case as it affects India. A time may be arrived at when we may be able to relax this; but, under present conditions, we do not feel that we can justifiably do so."

Dr. Duff asked if ships all go to Bombay from the East Coast and I stated that some may go to Colombo and some to Calcutta by way of Colombo. Dr. Smith of Zanzibar said that there was no passenger line which he knew of direct from East Africa to India except to Bombay; but cargo ships and rice ships come often from Bengal.

Dr. Duff suggested that, as yellow fever can spread by man, if it did creep across the African continent in any way, it might possibly get on board ship and so reach India.

Dr. Scott said that the importation of virus was one of the questions on which he wanted a definite answer to take back to his Government. Control under licence was he thought more suitable in each case than absolute prohibition; but in Tanganyika they had no known private laboratories. It seemed to him that an unauthor-

ised person if he went to work on that line could import or smuggle the virus whether there was prohibition or licence and he thought he would do so. He did not see that, by making the difference of prohibition as distinct from licence, we could prevent this. In the big municipalities the power of entry of medical officers of health assisted entry into private dwellings. He asked if any Indian women were qualified sanitary inspectors and therefore employable in a case where a man would not be?

I said: "Right of entry does exist and, a Hindu house, where the women are not in purdah, could be entered by a male inspector by arrangement, but this was not so easy with Musalmans. Medical Officers of Health have the right of entry; but with discretion. With regard to female sanitary inspectors, women are employed in various health capacities; but we do not call them sanitary inspectors. Some large Health Departments have women attached to them for various purposes which might be regarded as including this".

Sir George Buchanan said: "It is rather important for a rapporteur to be able to produce some draft giving the sense of the meeting on the question of the importation of virus. I imagine it is quite possible for the Conference to say that, provided suitable control is exercised in regard to its use in responsible laboratories by responsible people, there is, at any rate for certain countries, a very definite advantage in virus being obtained. On the other hand there are conditions in certain other countries which makes the importation of virus undesirable. We do not want the customs of the Far eastern countries forced down our throats. It is a question of finding some sort of formula.

To this I replied that, ordinarily, there was no intention that this should be made applicable to countries in the position of some of the unaffected countries in Africa. We in India were dealing with a tremendous aggregation of peoples."

A final general discussion took place in which Sawyer, Johnson, Orenstein, Smith and Leo took part.

(a) Dr. Sawyer outlined future Rockefeller policy regarding work on yellow fever saying that the consensus of opinion was that the investigation should be pushed to enable countries like East Africa and India to have more accurate ideas regarding the distance of infection and any changes in this. If a thing is worth knowing it is much more valuable to know it soon than in the dim future. He stressed also General Graham's argument regarding the weak links in the chain. There was a heavy responsibility now on the administrations concerned to investigate, administratively if possible, the great band of territory between French Equatorial Africa and Angola on the west to Kenya and Portuguese East Africa on the East. Lagos laboratory will now continue its present work for a year or more in view of the interest of "Office" and League of Nations; but the second phase should be by the various Governments taking over and controlling whatever work is needed and as seems

to them wise. A certain amount of laboratory work would probably be necessary for rational control of yellow fever at the present time. Such laboratory work would be done under two separate kinds of conditions either in Europe, America, ports of Africa where the vector was not present, or where, though epidemic yellow fever had been present recently, the risk, owing to control, was small. He indicated two laboratories for the West Coast, at Lagos and Dakar; but he hoped that, in countries like Belgian Congo, no restriction would be placed on virus importation. Soon there would be three or four laboratories on West Coast doing yellow fever work. Such work can best be done for British India and Netherlands East Indies in London and Amsterdam, especially the less urgent work. There were, however, some other urgent questions to be considered:

- (a) As serum testing of convalescents in Africa would be very helpful; laboratories for this were essential.
- (b) A Yellow Fever Board was needed.
- (c) Vaccination or personnel not going to Europe was necessary.
- (d) Laboratories for research and investigation some of which can only be done in the tropics were necessary.
- (e) Dangers have been greatly reduced, though *not* eliminated, by (i) introduction of attenuated virus which cannot produce yellow fever, (ii) by immunisation of the staff, thus eliminating the chief risk.

During this transition period the Rockefeller Foundation would be willing to help by giving any laboratory men facilities to learn technique or by sending a Rockefeller man to the laboratory in question. The brain test being expensive is difficult to run, and, in survey work, the collection of blood by the ordinary medical officer is unsatisfactory and a trained medical officer is needed. The Western African countries would be under Dr. Beenhakes' laboratory at Lagos and other Government laboratories. The Eastern African countries should begin at once a rapid superficial survey on lines which he could discuss and arrange at Cape Town now with all Administrative Medical Officers of East African Colonies as the principal work of the immediate future will aim to give an idea of what has recently been done with regard to yellow fever in the aforementioned zone across Africa.

*Dr. Ornstein* asked how he could be assured that his neighbours were carrying out the Convention conditions as he doubted if any "look and see" policy would be welcomed. He also raised the question of whether Central East Africa was a real buffer country, or a previously infected country, or one in which yellow fever was dormant, basing his question on the observation that during the war, despite the aggregation here of all kinds of troops from India, South Africa, Nigeria, etc., no case remotely resembling yellow fever had been reported and there was no epidemic. This great four years' experiment on a big scale should therefore be taken note of by this Conference.

*Dr. Gilks* remarked a similar big scale experiment in the building of the Uganda railway by Indian and other labour and strongly supported *Dr. Sawyer's* recommendations.

*Dr. Smith* stressed the danger of dhows which carried stegomyia in water butts as in the slave ships of old.

*Dr. Lee* intimated that Uganda would co-operate in *Dr. Sawyer's* recommendations. He asked if Belgian Congo would also co-operate; and communicate results, and was assured that the Belgian Congo Government were now collecting through their own officials and sending the material to Lagos; that the method of distribution would be published; and that collection should be done in units of 25 in accordance with the sample sheet or *pro forma* distributed (Rockefeller Form, Annex. 4).

24th November, Forenoon.

The final report on Yellow Fever by the Rapporteur (*Dr. Johnson*) together with an introduction by the Chairman was presented to the Plenary Conference on 24th November and adopted. It is such a valuable contribution that I make no apology for reproducing it in the body of this report; and, as it represents the considered views of the Conference, it must be studied in detail. I have reported the Yellow Fever discussions in detail as these represented expert views on the most important subject before the Conference and will be of the greatest assistance to Government of India in enabling it to decide on its future policy for yellow fever prevention and control.

## FINAL REPORT ON YELLOW FEVER (AS ADOPTED BY PLENARY CONFERENCE).

### PART I.—INTRODUCTION.

#### I.—*Distribution, etc., of Yellow Fever in Africa.*

The possibilities of extension of yellow fever to regions of Africa now unaffected by that disease, demand special attention at the present time from the international or inter-territorial point of view, in consequence of the opening-up of roads, railways, and new lines of traffic traversing territories of different Governments, and notably of the rapid extension of air traffic and air trunk lines.

The particular insect vectors by which yellow fever is carried from man to man, occur almost universally throughout Africa, and those mosquitoes, though themselves habitually keeping within or close to the dwelling and having (by comparison with the anopheles vectors of malaria) a very short range of dispersal, are nevertheless capable of being carried considerable distances by rail, motor car, or air, and in the latter case could be carried very rapidly for very long distances. Their danger to the distant-susceptible community,

if they should happen previously to have been infected in the yellow fever area, must therefore be taken into account. Seeing that the ridding of aircraft from mosquitoes is quite practicable, this danger has only to be appreciated to be removed. Human infection, however, is more troublesome. Fortunately, the infective healthy human carrier, so formidable an obstacle to the control of many other epidemic diseases, has not to be considered in yellow fever; the danger from human transport is essentially limited to the person actually suffering or about to suffer from an attack of the disease, and who in point of infective ability only needs to be controlled during a few days of his incubation period before the illness arises, and for the first three days after his illness has begun. But within these limits the risk of the rapid transport of such a person to an unaffected region, there to infect the mosquito vectors, is obviously facilitated by aviation and must be guarded against.

These considerations are not only of importance to territories on the Eastern and Southern portions of Africa where yellow fever has hitherto been unknown, but even further afield to countries on the other side of the Indian Ocean, where the insect vectors also abound, and which could not be indifferent to an extension of the disease to African regions with which they are in frequent communication. Moreover, native populations from which yellow fever has (so far as is known) always been absent are at some disadvantage as compared with those in which the disease has been endemic for many generations. The susceptible person in the first case is more liable to severe or fatal attacks, whereas the susceptible person in the second case has usually a degree of resistance to the results of the infection which makes his diseases less formidable.

In the broad sense, yellow fever has to be regarded as endemic over a large section of Western Africa. The term is used here in a wide sense—including in endemicity the manifestation of the effect of local epidemics occurring intermittently among the native populations. This endemicity (or these local epidemics) carry with them a relatively low native morbidity and mortality. Their incidence is largely on the susceptible child population of the community. Measles, in the Northern countries, provides a parallel in this respect.

As an attack of yellow fever, even though mild, confers practically a life-long immunity against another attack there are vast regions in West Africa in which the proportion of the adolescent and adult native population insusceptible to yellow fever is high. This insusceptibility, implying as it does that the larger part of the population is quite incapable of infecting the mosquito vector, itself forms a most powerful agent under present conditions for the protection of the European or other susceptible person who lives in or who traverses such regions. Nevertheless the influx, collective or individual, of susceptible people into these regions at a time when yellow fever is prevalent among the native populations, leads to yellow fever attacks or outbreaks. The occurrence of yellow fever

in a place where that disease has not previously been known is, in fact, often to be explained—not by the introduction of a new infection from without, but by a new introduction of susceptibles, *e.g.*, in course of the penetration of a little known country, or of the establishment of new outposts or new conditions of labour.

For present working purposes, though on admittedly incomplete knowledge, we may regard yellow fever infection as endemic, in the sense above explained, over a wide area of West Africa—on area possibly reaching along the coast from the Senegal southward to the Congo, with a quite uncertain extension inwards from that coast to the centre of the continent. Greater precision on this matter is of first importance and now can be obtained, not by the uncertain method of collecting records of casual reported cases of yellow fever itself, but by the regional application of the tests for insusceptibility (particularly the “mouse protection tests”) to sample populations, which we owe to the workers of the Rockefeller Foundation and which has been specially applied and tried out by them in Nigeria, and from the Laboratory at Lagos. It is important, on every ground, to attempt a rough geographical delimitation of this endemic area of the continent, by working with these tests outwards from the known endemic areas and inwards from the south, east and north. There is already evidence that the application of these tests at a relatively small number of widely separated points, selected in different territories and made with the aid of their medical services, may in a short space of time give results invaluable for such an outline. The Conference learned with much satisfaction that an immediate extension of the work of the observers of the Rockefeller Foundation in this direction is to be considered, and during the Conference Dr. Sawyer concerted a programme of action for this purpose with Delegates of several of the territories concerned.

It is necessary, in this connection, to emphasise that the objective of the Foundation in so doing would be to supplement the research work it has already undertaken, and give a lead or assistance to the field or laboratory workers of the Administrations concerned; in this as in other matters it is no part of its intention to act as a centre on which African Administrations and their medical services will draw permanently in the carrying-out of their daily anti-malaria work. Subject to this observation, the Conference strongly recommends that all assistance from the Rockefeller Foundation workers should be invited, welcomed and utilised to the full in any African country which that body regards as appropriate for the research on geographical distribution of yellow fever infection which it has in hand.

## II.—*Air Traffic and Carriage of Yellow Fever Infection.*

By the terms of the International Sanitary Convention for Aerial Navigation, 1932, which will shortly be opened for signature at the Hague, certain West African Colonies will automatically come into the category of territories in which yellow fever exists



independently, either in the country as a whole, or in particular sections of it. This, at least, is not in itself dependent on the recent research work and the application of the "mummy protection" tests, but follows from long years of experience of the occurrence and control of yellow fever in the Colony alike among Europeans, Asiatics and Natives. In these colonies (or in sections of them) the Convention requires that certain specified precautions should be observed in the selection of aeroplanes for the purpose of international flight, in their equipment when selected, and in their habitation. The nature of these precautions has been fully considered by the Yellow Fever Commission of the Office International d'Hygiène Publique, as well as by its Permanent Committee, and they have the recent and advisory of the various authorities on aviation which were consulted in the preparation of the Convention.

After giving careful consideration to the Yellow Fever Chapter of the Convention, as well as to its other provisions, the Conference is convinced that the immediate acceptance of the principles therein formulated will not only form an invaluable safeguard against the spread of yellow fever to other countries when air trunk routes are established, but is needed in advance of their establishment, so that the conditions required for security will be known when these routes are being planned.

Acceptance of the Convention is of equal importance to countries which, though free from yellow fever, have reason to consider themselves threatened. On the one hand, due recognition will be given to the work which the Administrations of the yellow fever infected countries will undertake for the benefit of their more fortunate neighbours, on the other hand, a code of supplementary action, recognised internationally, will be available within the threatened country and will form an additional safeguard. It may be here added that the Conference has taken the occasion to examine the International Sanitary Convention for Aerial Navigation, 1932, not only in its relation to yellow fever but also in regard to its provisions for other diseases, and has no hesitation in advising its signature on behalf of all the Administrations in Africa which possess competent medical services.

It should be observed, also, that the recent research work on yellow fever should prove particularly useful in the application of the yellow fever chapter of the Convention. Application of the tests for immunity to the personnel of an aeroplane, or to inhabitants in its vicinity, will have obvious advantages— as also will the vaccination referred to below.

### III.— *Control over Yellow Fever in West African Colonies.*

There should be no attempt to minimise the value and success of the methods which, for many years past, have been adopted in West African colonies to safeguard Europeans and other susceptible

methods, and to those who direct and apply them, that the yellow fever peril now rarely enters into the calculations of the inhabitants of these colonies, and that morbidity and mortality from this disease are now negligible by contrast with bygone years.

Rational and prudent habits of life, the sanitation of communities, particularly by the provision of piped water supplies coupled with systematic measures to prevent the breeding of domestic mosquitoes in and about houses, together with the policy of keeping European dwellings or settlements at a distance from native quarters—these and other measures have been fully described to the Conference by the Delegates from Nigeria and the Gold Coast, as the result of their long experience. The efficiency of such measures when properly applied is beyond question, particularly when they are combined with the early and accurate diagnosis of cases, and the prompt notification of those which are suspected or doubtful as well as those which are unmistakable.

The experience of modern methods of control, as well as the more exact knowledge we now possess of the yellow fever virus and its method of transmission, thus encourage the belief that should yellow fever infection enter regions in Africa hitherto free from it, it is capable of control and limitation in a way which, for example, would be quite impossible with a disease like influenza, or even with malaria. To the extent, therefore, that hitherto uninfected countries find themselves threatened with the introduction of yellow fever at particular dangerous points where their territory is penetrated by new land or air routes from an infected country, they have always a mass of experience available on which any special preventive measures needed at those points can be based.

#### IV.—*Prospect of additional safeguards by Vaccination.*

There is strong experimental evidence that the method of vaccination now available consisting of the injection of an immune human serum and yellow fever virus fixed for mice is capable of giving to the person vaccinated a durable protection against his developing yellow fever as a result of mosquito infection or accidental inoculation of the yellow fever virus in the laboratory. This evidence is already sufficient to justify the vaccination of persons specially exposed to risk, whenever the vaccine is available. Its production, however, is limited by various considerations of time, skill and cost as well as by the number of available donors of immune serum and its use on anything like a general or comprehensive scale for whole populations, or even for the smaller populations of particular European settlements, can hardly be regarded as practicable at present. It would appear to offer great advantages for the personnel of aerodromes or aircraft, or those otherwise engaged regularly in transit between infected and non-infected countries. It is already available to some extent for such persons, and its use for them should be encouraged in every way.

### V.—*Importation of Yellow Fever virus.*

The loss of valuable life which has attended experimentation with yellow fever virus, and the many risks which accompany its use or handling have led the Governments of important countries East Africa (including India and the Dutch East Indies) to prohibit absolutely any importation of the virus for laboratory as well as for any other purposes. The view held in these countries has been that laboratory work with yellow fever virus ought to be carried out either in countries already infected, or in those which, on account of the absence of insect vectors, are not infectible. The risk is not only to the laboratory worker or attendant, but also to the community outside in which infection might be started by an infective laboratory worker while incubating the disease. The Conference without in any way questioning the official action thus taken in the East, hesitates to advise similar unqualified prohibition of the entry of yellow fever virus in those African countries which are free from the disease, but may be considered to be threatened by it. Notwithstanding the present possibility of sending blood serum from suspected cases to Lagos to be tested against the yellow fever virus in the Rockefeller Foundation Laboratory or to other laboratories further afield (London, Paris, Amsterdam, New York, etc.), it remains important for Administrations in Southern and Western Africa to be able themselves promptly to undertake diagnostic tests, perhaps to prepare and issue vaccine, and do other work with the yellow fever virus in laboratories of their own, which are adequately controlled by a responsible head. The dangers apprehended, moreover, do not appear to arise if the virus employed is the "fixed virus" used for the "mouse protection" tests and vaccination—seeing that this fixed virus has never so far been proved capable of reproducing yellow fever in man or in the monkey. And the vaccination of laboratory workers will, it is confidently hoped, in future remove the risk of their conveying the infection outside. Hence the Conference ventures the advice that any special legislative or administrative restriction which may be imposed by African Administrations on the entry of yellow fever virus, should be qualified by the reservation that its conditional admission may be authorised where the needs of the public health service and the precautions taken justify such a step.

### PART II.

This Report, upon information furnished and the discussions held on 16th, 17th and 18th November, has been arranged as follows:—

- I. Papers read, or laid on table.
- II. Summary of Facts elicited concerning epidemiology and the delimitation of endemic areas:—
  - (1) Recent studies by means of protection tests.
  - (2) Specificity of protection test.

- (3) Virus reservoirs and carrier cases.
  - (4) Non-virulent strains of virus.
  - (5) Racial resistance or immunity.
  - (6) Risk of infection with yellow fever in endemic and in non-endemic areas.
  - (7) Effect of introduction of non-immunes into district.
  - (8) Infectibility of Eastern and Southern Africa and of the East with Yellow Fever.
  - (9) Evidence of absence of infection with Yellow Fever in East and Central Africa.
  - (10) Possibility of *Aedes aegypti* travelling by aeroplanes or motors.
  - (11) Possible routes by which infection may spread from infected to non-infected countries.
  - (12) Plans for extension of protection test surveys.
  - (13) Laboratories in Africa capable of undertaking Yellow Fever investigation.
  - (14) Function of laboratories undertaking Yellow Fever investigation.
  - (15) Importation of Yellow Fever virus into non-infected countries.
  - (16) Protective vaccination against Yellow Fever.
- III. Principles of the International Sanitary Convention for Aerial Navigation, 1932.
- IV. Existing and projected air routes.
- V. Measures applied or proposed for the control of Yellow Fever and the *Aedes* vector—
- (1) By Governments of countries in which yellow fever is endemic.
  - (2) By Governments of countries which are infectable with yellow fever.
- VI. Statement of Delegate representing the Government of India.
- VII. General principles upon which Delegates were in agreement.

*I.—Papers read or laid on table.*

A. Translation of the Report made by the Yellow Fever Commission to the Permanent Committee on recent knowledge of Yellow Fever. (Office International d'Hygiène Publique.)

B. The Present Knowledge of Yellow Fever as it relates to the Problem in Africa. (Dr. W. A. Sawyer, Associate Director of the International Health Division, Rockefeller Foundation.)

C. Latest information in regard to Air Routes. (Received through the Director of Air Services, Union of South Africa.)

D. English Text of the International Sanitary Convention for Aerial Navigation, 1932.

E. Note by Sir George Buchanan regarding Discussion on the Air Sanitary Convention.

F. Note on Yellow Fever Control in the Gold Coast and the Present Situation. (Dr. Duff, Director of Medical and Sanitary Service, Gold Coast.)

G. Note on Yellow Fever in Angola by Dr. Damas Mora.

H. Note by Dr. Scott of Dar-es-Salaam.

## II.—*Epidemiology and the delimitation of Endemic Areas.*

(1) *Recent Studies by means of Protection Tests:* Protection tests upon the sera of 4,368 persons from 92 towns in West Africa have demonstrated widespread infection either in endemic form or due to repeated epidemics. Many towns, however, have been shown to have been free from infection during the present generation, or during recent years, but in view of the widely distributed case incidence amongst the non-immune, though resistant, population from the Coast to the Sahara outside the known endemic areas, no hope of early *eradication* of Yellow Fever from West Africa can be entertained.

(2) *Specificity of Protection Test:* The balance of evidence supports the view that the test is specific for Yellow Fever and that no cross-immunity exists with Dengue or other fevers.

(3) *Virus "reservoirs" and Carrier Cases:* Man must be regarded as the only Yellow Fever "virus reservoir". Although virus may persist in the tissues for some time after the blood ceases to be infective to mosquitoes this will be neutralised in the blood by circulating anti-bodies, and it is certain that persistent healthy "carriers" of virus cannot exist. While it is undoubted that in the normal method of transmission the *Aedes* requires a certain interval (usually 12 days) after feeding on an infected blood before becoming infective to a susceptible animal, there is no evidence that the virus during this interval goes through a new phase or life cycle in the mosquito.

(4) *Non-virulent strains of virus:* There is no evidence to suggest that in nature non-virulent strains of virus exist which might immunise against virulent strains. If that were so it would be expected that Europeans tested after long residence in West Africa would frequently have given positive protection tests, but this is not the case. In the rare positive cases most of these persons concerned can remember an illness which might well have been an attack of yellow fever.

(5) *Racial resistance or immunity:* West African Negroes show a high degree of resistance to the infection of yellow fever, even after removal from an endemic area for generations, although severe and fatal cases do occasionally occur. Asiatic races have been shown

to be susceptible. Nothing is known concerning the infectibility of East African races.

(6) *Risk of Infection with Yellow Fever in Endemic and in non-endemic areas*: Owing to the large proportion of immunes present in an endemic area, and the consequently low *aedes* infection rate, the risk of infection of susceptibles is not great. The risk is considerably greater when an explosion of the disease occurs in a non-endemic area, where a large number of non-immunes exist. The general conclusion may be drawn that Yellow Fever is not so infective as generally imagined except during epidemics of the disease unless intimate contact, as in houses, is made.

(7) *Effect of introduction of non-immunes*: Introduction of large numbers of non-immunes into a district may produce a flare up of the disease in a recognised endemic area or may even cause an epidemic in an endemic area not previously recognised as such.

(8) *Infectibility of Eastern and Southern Africa, and of the East, with Yellow Fever*: Although with some exceptions no very detailed *aedes* surveys have been made in these countries delegates have no doubt that in most cases the *aedes* population of towns is considerable. No information is available to the Conference concerning the *aedes* infestation of the Anglo-Egyptian Sudan. In India detailed surveys of ports, made before the war in connection with the supposed risk of Yellow Fever infection due to the opening of the Panama Canal, showed a high *aedes* infestation.

(9) *Evidence of absence of infection or latent endemicity of Yellow Fever in East and Central Africa*: No protection tests have yet been carried out; but it is significant that the introduction of large numbers of non-immunes on the East of the continent during the war, and the penetration of Indian traders, have not led to the occurrence of cases suggestive of yellow fever.

(10) *Possibility of Aedes Mosquitoes travelling by aeroplanes or motors*: Experiments demonstrating that *aedes* mosquitoes can travel long distances by aeroplanes were cited, but it was agreed that the risk of transporting mosquitoes in an infective condition is comparatively small and can be met by the simple measure of de-insectisation of aeroplanes. *Aedes* may travel by trains or motor with equal facility. The transportation of persons during the incubation period of the disease appears to constitute a greater danger than the carrying of infected mosquitoes.

(11) *Possible routes by which infection may spread from infected to non-infected countries*: Slow "village to village" spread of infection along trade or motor routes, particularly new routes, requires to be considered as well as its more rapid conveyance by aviation. In this connection it was pointed out that the construction of good motor roads north of the Congo River constitutes a risk to the Anglo-Egyptian Sudan and to Uganda. Of particular importance is the route Yaounde-Bangui-Bangassou-Buta-Aba. It was agreed that should protection tests prove the present non-existence of Yellow Fever along such routes re-surveys should be made

from time to time to watch for such possible village to village advance of the disease.

(12) *Plans for extension of Protection Test Surveys*: It is of great importance that protection test surveys should be continued in order to test every link of the chain from West to East and South. The proposed surveys fall into two groups—(1) Western Countries bordering upon or in close communication with West Africa, and (2) Eastern and Southern African countries.

Dr. Sawyer explained that surveys of group (1) above, *i.e.*, of French Equatorial Africa, the Belgian Congo and Angola, are now in progress with respect to the Belgian Congo and that arrangements have been completed for the surveys of French Equatorial Africa and of Angola. These surveys will be organised from Lagos where the laboratory tests will be carried out. With respect to group (2) arrangements have been made during the progress of this Conference between Dr. Sawyer and the representatives of the Eastern and Southern African countries for a rapid and intentionally superficial, survey, the laboratory tests to be carried out at New York. Should positive tests be obtained further more detailed surveys will be required.

It was considered of importance that the Anglo-Egyptian Sudan, not represented at this Conference, should be asked to enter into this investigation.

Such surveys as described above will throw light upon the question as to whether the East African countries may be regarded as non-infected buffer states between West Africa and the orient, or whether they already contain dormant yellow fever which might flare up upon the introduction of large numbers of non-immunes.

Dr. Sawyer stated that it is not the intention of the Rockefeller Foundation to carry out protection test surveys in Africa indefinitely, so that in order to utilise the Rockefeller organisation immediate use should be made of the existing facilities.

(13) *Laboratories in Africa capable of undertaking yellow fever investigation*: It was agreed that upon the termination of the work of the Rockefeller Foundation laboratories will be required in Africa at which yellow fever investigation may be carried out. Dr. Sawyer explained that the Rockefeller Foundation would almost certainly be prepared to assist this object by training Government Pathologists in this work or even, possibly, by lending trained investigators temporarily from the Rockefeller Foundation to the Government laboratory staff. In addition to the Medical Research Institute at Lagos, it was hoped that the French laboratory at Dakar would also be available to carry out such work. It was hoped also that the Government of the Belgian Congo would consider undertaking such work in the Belgian Congo. With respect to the Eastern and Southern countries in Africa it was agreed that facilities should be available either at some central institution such as the Medical Research Station at Johannesburg or at some centre in East Africa, or at both.

(14) *Function of Laboratories undertaking yellow fever investigation* : Dr. Sawyer suggested that the work of such laboratories with respect to yellow fever work would comprise :—

(a) Urgent work—i.e., testing serum of convalescents by means of protection test as an aid to diagnosis, and testing the sera of persons wishing to travel.

(b) Vaccination of laboratory staff [see section (16) below].

(c) Re-survey work by means of protection test to be undertaken from time to time.

(d) Investigation of new problems such as the infectibility of potential insect vectors of the disease.

(15) *Importation of yellow fever virus into non-infected countries* : With reference to the prohibition made by certain infestable countries against the importation of yellow fever virus it was agreed that the availability of laboratory assistance for yellow fever detection and control is of such importance that the Governments of African countries should be advised to sanction the importation of virus under licence for use in Government laboratories.

It was pointed out that fixed mouse-brain virus cannot be reconverted into yellow fever virus infective to man and that, moreover, the risk of infection occurring within a laboratory, or outside from this source, is non-existent provided that the whole European and African staff of the laboratory be immunised by protective vaccination. For the above reasons the importation of virus under strictly controlled conditions into non-infected countries involves a minimum of risk. The only virus required for the work in section 14 (a), (b), (c) is the fixed mouse-brain virus.

(16) *Protective vaccination against yellow fever* : In commenting upon the technique of yellow fever protective vaccination by means of fixed mouse-brain virus combined with immune serum, Dr. Sawyer stated that steps are being taken in England to overcome the difficulty of obtaining immune serum by immunising a number of selected regular serum donors, and he suggested that native donors in West Africa would no doubt be available. Although vaccination, as now practised, could not be used to immunise a large population it can and should be used to protect persons who are particularly exposed to infection, laboratory staff, etc., and it is possible that the extension of its use to immunise persons who wish to travel by aeroplane may in time be practicable; and prove useful under particular conditions. If human immune serum is used no objectionable reactions are produced as might be the case if the sera of other immunised animals were used.

### III.—*Principles of the International Sanitary Convention for Aerial Navigation, 1932.*

Sir George Buchanan explained the principles of this Convention and that the need of this Convention arose, as in the case of the



International Sanitary Convention, in order to prevent the imposition of needlessly harassing restrictions upon air service. He mentioned the difficulties which were beginning to arise owing to the insistence by certain countries upon Bills of Health, visa'd by Consuls, for aeroplanes. Sir George Buchanan pointed out that air services are already controlled under the International Convention for Air Navigation—the Ican—and that the number of aerodromes open for international traffic is already limited, by that Convention and otherwise, for the purpose of customs regulations, etc.

(2) In drafting the new air sanitary Convention the International Public Health Office in Paris was able to start with a basis that facilities are already provided under the International Sanitary Convention for dissemination of information concerning the occurrence of infectious diseases.

(3) In dealing with the provisions made with respect to yellow fever Sir George pointed out that none of the fundamental observations upon which successful public health control of yellow fever is based have been disturbed by recent studies of the disease (see page 24 of attachment A). In view of the comparative ease with which aerodromes may be freed from the risk of infection with yellow fever the onus with respect to this disease is laid very largely upon the “exporting” country.

(4) With reference to Article 42 (2) of the Convention Sir George explained that the term “exposed” to infection of yellow fever means exposure to definite risk of infection such as contact with a known case of the disease or exposure in a house known to be infected.

(5) Article 46 makes provision for mutual agreements and understanding between neighbouring infected territories.

(6) Article 48 makes provisions whereby one of the High Contracting Parties may prohibit the landing of aeroplanes within its territory under exceptional circumstances, providing that reason for such action be stated. The Government of the country exercising this power in the case of yellow fever is itself the judge of the circumstances which call for its use and for the justification required by the Article.

(7) Points which arose in discussion upon the draft sanitary air convention, particularly with respect to the obligations undertaken by Governments which adhere to it have been summarised by Sir George Buchanan and are attached (*vide* Appendix 6).

(8) It was agreed by delegates from the African countries that their respective Governments should be advised to become signatories to the Convention, it being understood that in such case the respective Governments, in accepting the principles of the Convention, agree that, in the event of international air routes being projected, the relevant articles of the Convention will be applied in their territories. In countries where yellow fever is prevalent the ratification

of the Convention will not necessarily involve the immediate construction of anti-amaryl aerodromes but it will involve such action before such Governments may permit the use of aerodromes within their territories for the use of international air service. Information gathered concerning the presence of yellow fever, as described in Article 36 of the Convention, will be notified as mentioned in Article 37 to the Office d'Hygiene Publique and come regularly under review by the Yellow Fever Commission which reports at each session to the Permanent Committee of that Office. It was suggested that, in the absence of special urgency, any new facts about yellow fever in a territory might be communicated to the Office in the form of a quarterly or half-yearly statement.

#### IV.—*Existing and projected air-routes.*

Information concerning projected air-routes is contained in Attachment C. Owing to financial depression it is probable that there may be delay in proceeding with certain of the schemes for new trunk routes which are projected.

While no regular air service exists as yet between countries known to be infected with yellow fever and countries believed not to be infected, there is every reason to be prepared for such services being planned and put into operation. (Map 8.)

#### V.—*Measures applied or projected for Aedes and Yellow Fever control.*

(1) *By Governments of countries in which yellow fever is endemic:* Methods of *Aedes* control, as carried out in the Gold Coast (see Attachment E) and in Nigeria were described; the importance of the following points was emphasised:—

- (a) Institution of pipe-borne water supplies in towns, with adequate supply to the native section of such towns.
- (b) Routine eradication of *Aedes* breeding and the record of *Aedes* larval indices. Checking of such larval indices by means of adult *Aedes* indices. The use of electric torches, or other illuminant, by sanitary inspectors for both larval and adult *Aedes* surveys was advocated.
- (c) Segregation of the highly susceptible European population in European residential areas protected from native towns by a building-free zone of at least 440 yards. It was pointed out that the main value of European residential areas is that these can be kept free, or almost free, from *Aedes* infestation, so that the importation of a person in the incubation period of the disease will not lead to an outbreak of yellow fever. The advantage of the limitation of numbers of African servants and of their dependents particularly their children was stressed.

(d) Education of European and African population concerning the method of transmission of yellow fever.

(e) Importance of the medical staff notifying any case which is in any way suggestive of yellow fever as a suspicious case of the disease, and subsequent checking of the diagnosis by protection tests in case of recovery, or by post-mortem examination in case of death. Although not absolutely pathognomonic it is recognised that the mid-zonal necrosis and eosinophilic degeneration of liver cells, found so typically in yellow fever, is of high diagnostic value.

(2) *By Governments of countries which are infectable with yellow fever* : Dr. Damas Mora, representing Angola, produced evidence that yellow fever existed in Angola from 1860 until 1900, but he stated that no cases suggestive of yellow fever have been reported since 1900.

Most delegates reported that with some exceptions, no detailed *Aedes* Surveys have been made in Eastern, Central and Southern African Territories.

It was also reported, however, that there are many regions in these countries in which the *Aedes* density must be sufficiently high to render them infectable with yellow fever, and it is reasonable to assume that this applies to other African countries not represented at this Conference. Moreover, the regional occurrence of Dengue Fever throughout Africa supports the above view.

It was agreed that further *Aedes* survey work is desirable, and that considerably more active *Aedes* control should be undertaken than is at present the case at points in infectable countries which may be considered to be particularly vulnerable to the introduction of yellow fever infection. Information concerning the *Aedes* infestation along motor and trade routes connecting West Africa with East Africa would be of great value.

#### VI.—*Statement of delegate representing the Government of India.*

General Graham outlined the history of the attitude taken by the Indian Government towards the possible risk of the introduction of yellow fever into India, laying special stress upon the immense population at risk and upon the difficulty which would be experienced in the eradication of the disease if once established. He pointed out that an *Aedes* survey undertaken at some of the major ports in India before the War, revealed a high *Aedes* infestation, and that owing to the condition of life in large Indian towns, *Aedes* control is exceedingly difficult. Observations published concerning the possibility of protracted incubation periods of the disease in man and of protracted infectivity periods gave further cause for anxiety.

For the above reasons and to meet the point of view of the Government of India, General Graham stated that the Office International d'Hygiène Publique had altered Article 48 of the Air Sanitary Convention to read as in the present draft, and had recorded their views of its interpretation in their proces-verbaux.

The Government of India meantime felt that, although anxious to avoid interference with the ratification of the Air Sanitary Convention, yet in the light of available information and in accordance with present conditions, prohibition of air traffic from yellow fever areas to susceptible areas was the only reliable safeguard.

General Graham stated that the discussion at this Conference would be of great assistance to the Government of India as defining the concerted action to be taken by the Governments of susceptible countries in Africa; but, in view of the possibility of the introduction of yellow fever into the Sudan or East Africa, owing to a breakdown in measures taken in any one link of the chain from west to east, the position still required further consideration before the future action of the Government of India can be decided upon.

#### *Conclusions.*

1. None of the fundamental observations upon which public health control of yellow fever is based have been disturbed by recent knowledge. Although under exceptional conditions the incubation period in man may be protracted or the infectivity period may be prolonged, and although experimentally a wider range of dispersal of the mosquito vector has been shown to be possible, yet for practical purposes public health control of yellow fever can be based upon the observations that yellow fever is transmitted from actual human cases only in the first three days of the attack, that the incubation period of new cases does not exceed six days, that the agent of transmission is a domestic mosquito which remains in, or in the immediate vicinity of, the house where it has fed, and that the insect after feeding upon an infected case must survive for twelve days before it can transmit the virus to another person.

2. The mouse-brain virus protection test may be accepted as specific for yellow fever. [Section II (2) of Summary.]

3. Large areas in Central, Eastern and Southern Africa, believed at present to be free from yellow fever infection, must be regarded as infectable. [Section II (8) of Summary.]

4. It is of obvious importance that immediate action be taken to ascertain the position with respect to the presence of the disease, unsuspected, in endemic form, and also to the susceptibility of the population to the disease, in those African countries in which yellow fever has so far been unknown. In these inquiries the Government of the Anglo-Egyptian Sudan, not represented at this Conference, should be invited to participate. It is satisfactory to record that action recommended in this section is already envisaged in French

Equatorial Africa, as well as in Angola; that protection test surveys have already been commenced in the Belgian Congo, and that arrangements are now in progress for similar surveys to be carried out in Union of South Africa and Bechuanaland Protectorate, South-West Africa, Mozambique, Southern Rhodesia, Northern Rhodesia, Tanganyika, Kenya, Uganda and Zanzibar. [Section II (12) of Summary.]

5. Steps should be taken for the provision of equipment and for the training of staff at appropriately selected and placed laboratories in Africa, where necessary work on yellow fever can be carried out after the termination of the detailed work covering many parts of Africa which is now being undertaken by the Rockefeller Foundation. Such work would include the performance of protection tests and of protective vaccination. [Section II (13) and (4) of Summary.]

6. For the purposes of paragraphs (4) and (5) above, the importation of fixed mouse-brain yellow fever virus should be permitted in laboratories in Africa under Government authority and control. [Section II (15) of Summary.]

7. The co-operation of the Rockefeller Foundation in the establishment of laboratories for yellow fever control advocated in paragraphs (4), (5) and (6) above, in the manner suggested by Dr. Sawyer, is particularly welcome. [Section II (13) of Summary.]

8. The action taken by the British Government in providing facilities in England for protective vaccination against yellow fever deserves attention, and it is hoped that other administrations concerned with public health work in Africa will provide similar facilities, at those laboratories where yellow fever work is being carried out or is being projected. [Section II (16) of Summary.]

9. The risk that infection with yellow fever from west to east may spread from village to village by the opening up of new trade and motor routes should be taken into account. It is hoped that the present position along such routes may be determined by protection test surveys of the population, and that the position thereafter may be reviewed from time to time by re-surveys. This slow method of spread of the disease may ultimately prove more capable of breaking down our defences than the more rapid spread which can result directly from modern fast means of transport. In this connection it is suggested that the excellent motor routes which now exist from the French Cameroons across French Equatorial Africa and the northern section of the Belgian Congo, need to be considered in connection with risk of infection to the Anglo-Egyptian Sudan and to Uganda. [Section II (11) of Summary.]

10. Although the possibility exists of transport of infected mosquitoes by air, rail or road, it is considered that the greatest risk, or at least the more difficult risk to avoid, consists of the transport

of a person during the incubation period of the disease. [Section 11 (10) of Summary.]

11. It is agreed that the Governments of African countries should be advised forthwith to accept and ratify the International Sanitary Convention, 1932, for Aerial Navigation. [Section III of Summary.]

12. The systematic communication of new facts in regard to yellow fever in Africa to the Office International d'Hygiene Publique in Paris, for consideration by its Yellow Fever Commission, is provided for by the above Convention and this system should be utilised as fully as possible. [Section III of Summary.]

13. Yellow fever control, as now carried out in the West African Colonies, is an important factor for the protection of neighbouring Colonies from yellow fever infection, and it is important that these measures should be continued and this efficiency augmented. Special stress is laid upon the provision of pipe-borne water supplies, active destruction of *Aedes* in towns and villages, and the segregation of non-indigenous populations in residential areas in which effective *Aedes* control can be maintained. [Section V (1) of Summary.]

14. The Health Departments of African countries believed at present to be free from yellow fever infection should obtain more information concerning the *Aedes* infestation than is now available, and should introduce or make effective measures for the control of *Aedes* (including larvae) in those centres at which risk of introduction of yellow fever infection is specially to be apprehended. [Section V (2) of Summary.]

#### *Veterinary Aspects of Aircraft Development [Agenda V. 1 (2)].*

A paper on "Transmission of Animal Diseases by Aeroplanes" was presented by Dr. P. J. du Toit, Director of Veterinary Services for the Union of South Africa, and a delegate (see Appendix 27).

He developed the close connection between yellow fever and some diseases of animals and thought that it was only accidental that yellow fever was not an animal disease like Rabies. Foot and mouth disease was both animal and human. He referred to the influence of the war in inaugurating a changed view point regarding transport and its dangers; to the fact that aeroplanes were a minor risk compared to some others; to the case of the dog in an aeroplane introducing Rabies into the United Kingdom; and insisted that no amendment of the International Sanitary Convention, 1926, seemed to be needed but only local measures to cover the risks. If, however, air traffic in animals showed signs of increase, the Paris Bureau might then work specifically on the subject. It was suggested in the discussion that animal disease was handled differently because of the difference in the relative values of life and that in any case the dangers were rather regional in character.

## PLAGUE.

Plague was considered in plenary session on the 18th, 21st, 24th and 25th November and a demonstration of cyanide fumigation of rodents was given in the field on the afternoon of 22nd November.

The discussion was confined to South African plague; and the remarks which I made on certain aspects of our experience with Indian plague were made at the request of the Chairman at the end of the discussion and by way of giving additional information and a new view point. All African delegates in order made statements giving their experiences.

(1) *Union of South Africa*: (a) The discussion was introduced by Sir E. Thornton who read a paper on "The position in regard to Plague in the Union of South Africa" illustrated by maps (*vide* Appendix 14). This dealt very largely with rodent plague, both domestic and veldt, and with human outbreaks in association with it.

(b) It was followed by a paper on "The plague situation in Ovamboland" (South West Africa) by Dr. Huisbeeck of Windhoek (*vide* Appendix No. 15). This also dealt with rodent plague and was illustrated by maps.

A note by Dr. Morgan, Ministry of Health, on various papers presented at the Office International d'Hygiène Publique on the appraisement of the value of inoculation as a protective measure was circulated (see Appendix 19).

Union of South Africa Pamphlets 317 (Health) on Plague Prevention and Rodent Distribution; and 321 (Health) on Rodents were distributed (*vide* Appendix 16 and 17).

(2) *Angola*: Dr. Damas Mora then read his very interesting paper which had been circulated on "Plague Epizootic in Southern Angola (Measures taken by the Department of Health and results obtained)" (see Appendix 18).

(3) *Kenya* (Dr. Gilks) said that Kenya was considered one of the world's endemic centres and much work had been done on plague there. The primary vector was not gerbils or the other veldt rodent—though these are infected—but *Rattus rattus* (the domestic rat), and its spread corresponds accordingly. They make their own vaccine according to Haffkine's method and rely on it and it is in demand; but rat extermination is encouraged and many are killed. The exact amount of plague is problematical as there is no reliable system of birth and death registration. In 1931 and 1932 no cases of plague were recorded. Cyano gas is being used.

(4) *Uganda*: Dr. Lee said that inoculation by Haffkine vaccine had been abandoned now. 56,000 deaths from plague had occurred during the last 20 years. He read a short note. Rodent deaths were investigated. Freedom from plague in Uganda was unlikely

because of the nature of the country. News of human plague is received in one day, of rodent plague in two days.

(5) *Tanganyika*: Dr. Scott said that plague was endemic long before the original British occupation in 1894 and that the original 1900 infection had an Indian origin; and it was highly probable that yeldt rodents became infected from this source. There had been many outbreaks which he referred to in detail. In 20½ years 52,907 people died of recorded plague.

(6) *Bechuanaland*: Dr. Dyke said they had retrenched their plague inspectors owing to their doubtful utility. In the Kalahari enquiry the natives were fully alive to the significance of rodent mortality as field mice were the food of the herd boys. In 1932, after Ovamboland outbreak, there had been a survey by the Union Government of the northern area of Union, *i.e.* South Bechuanaland. There had been rodent mortality; but nothing for the last three years. They had had no definite case of human plague.

(7) *Portuguese East Mozambique*: No remarks were offered.

(8) *North Rhodesia*: Dr. MacLennan said that only one epidemic—that of 1916-17—had occurred. It lasted only a year—over two million rats being destroyed. It was reported by Kinghorn. The Zambesi river and scarcity of food no doubt hinder its spread.

(9) *Nigeria*: Dr. Johnson said that after Sir E. Thornton's visit he examined the position during his tours. Their last plague case was in April 1931 and the date of last infected rat found was August 1931. There might be a possible slow spread by bush rodents into the hinterland.

A general discussion then followed which was taken part in by Drs. Park, Orenstein, Johnson, Graham, Mora, Nettle, Hinsbeek, Scott, Park Ross, Thornton and Buchanan. This touched on the meteorological conditions in burrows; bacteriophage; technique of HCN fumigation of burrows; rail transport and handling of grain for shipment in Natal. Dr. Park Ross, in regard to the latter, stated that with the elevator risks were eliminated very largely; but some maize came in bags and was 4 or 5 days on the railway. This was treated in stacks in the open with HCN gas for the good name of the port. One shilling per rat was paid by the Maritzburg Corporation for those killed on trucks from Maritzburg, the work being well done by boys. Difficulty occurred with cases of goods of mixed kind. He was pleased with General Graham's statement regarding the Port of Bombay.

Sir E. Thornton said that there was definite evidence of plague-infected rats coming from the ports but not *vice versa*. Regarding inoculation, the African was probably not so sophisticated as the Indian and mass inoculation had to be considered with the African psychology. [*N.B.*—This in my opinion undoubtedly entered into the question of the unpopularity of plague inoculation in the Union.] Their serum therapy statistics were of very little value. Wild



rodents flourished in cultivated ground; but jackals and vultures had been largely exterminated, these being the natural enemies of the rodents.

Regarding the survey of the Angola border, this could be arranged for and would be done by one of his chief rodent inspectors.

The draft report was considered on 24th November, and, after certain amendments had been made, was adopted by the Plenary Conference on 25th November (*vide* Appendix 20). Its title was "Report on the position in regard to and measures employed to combat plague in the Union of South Africa, the mandated territory of South West Africa, Angola, the East African Colonies and Protectorates, Bechuanaland, and other African countries represented at the Conference."

The conclusions of this report are appended herewith:—

(1) In South Africa the dissemination of plague depends principally on infection of wild rodents, in other parts of Africa the domestic rodents play the determining rôle.

In South Africa there is little danger of urban outbreaks of plague inasmuch as towns are protected by the building-out of rodents, by anti-rat measures, and in some instances, by rodent-free belts. The problem is chiefly rural, and attacks on veldt rodents by means of trapping, gassing and poisoning are the principal anti-plague measures.

In East African countries local conditions are often unfavourable to an efficient anti-wild rodent campaign, even if such were necessary. Where the multimammate mice and other similar rodents play an important part, as seems the case in certain areas, an anti-wild rodent campaign would have to be undertaken; generally speaking however in East African countries anti-plague measures can be directed principally against domestic rodents.

In East Africa it would appear that the presence of *Rattus rattus* militates against the invasion of buildings by multimammate mice and similar rodent species, which were formerly domestic rodents in these countries.

(ii) A primary requirement, from the international point of view, is the sending, at suitable intervals, of information to the Office International d'Hygiène Publique regarding new evidence obtained about the extension of rodent plague and the measures taken to deal with it; in this way a record is available to the health administrations of all countries interested. Examples have been brought to the notice of the Conference of co-operation having taken place between countries infected with plague and others which have been threatened with the possibility of outbreaks. There can be no doubt that great benefit has resulted from this co-operation which has taken various forms; in one instance a conference was arranged to decide upon mutual action by the representatives of the Health Department of the Union and officers from South West Africa and

Angola; in a second instance a rodent survey of a portion of Bechuanaland Protectorate was carried out by the Union Health Department acting at the request of the Bechuanaland Government. The great importance of co-operation was realised and it was thought that even more could be effected in the future by local agreement between neighbouring countries and by following up notifications of epizootics or first cases of plague by communications outlining the course of the spread of epizootics or epidemics from time to time. Some anxiety was expressed as to whether the epidemic in South West Africa was under proper control, and it was thought that, if a rainy season occurred, it might be necessary for the administration responsible materially to strengthen the staff to enable the outbreak to be efficiently handled.

(iii) Much has yet to be learned regarding the protective efficacy of anti-plague vaccination in different circumstances and the degree of importance which should be assigned to this method of protection among those available for preventing the extension of human plague. The Conference noted that special enquiries on this subject are not in progress at the Office International d'Hygiène Publique, in which it is evidently desirable that African health administrations should fully participate. At the moment it was only possible to note the principal facts contributed by the Delegates present in regard to the employment of vaccination in their territories.

In British India, as is well known, anti-plague vaccination (Haffkine) is practised on a large scale as one of the routine precautionary measures, and is reported, on the basis of large experience, to be attended with considerable success. A vaccine prepared locally according to the Haffkine method is employed in South and East Africa. Vaccination of the mass of the population against plague is not now attempted either in Kenya or Uganda; but vaccination is, however, still used on a considerable scale for contacts in infected areas in Kenya, as also in Uganda and Tanganyika though to a less extent.

In Angola, the vaccine employed is obtained from the Pasteur Institute in Paris, and has been utilised on a large scale for prophylactic work when plague occurs. Little use is made of anti-plague vaccination in the Union of South Africa.

In general, vaccine is made available to and employed for the close contacts of infection, *e.g.*, those engaged in anti-plague work.

(iv) Disinfestation and disinfection of shipping was discussed and the attention of the Conference was drawn to the standards in respect of HCN and SO<sub>2</sub> agreed upon by the fumigation Commission of the Health Committee of the League of Nations.

(v) During its session the Conference had the advantage of witnessing a demonstration of the gassing of wild rodents by the use of cyanogas dust—a method which has been very efficiently deve-

loped in the Union of South Africa. In the practical application of this and similar methods of plague control, as well as in all aspects of plague research, it is important that African administrations should take as active a part as circumstances and opportunities permit, in order to add to our technical and scientific knowledge.

The economic aspects of rat destruction as distinct from disease dissemination must not be lost sight of in view of the extensive damage to property and food stuffs for which rodents are responsible.

## SMALL-POX.

### SMALL-POX DISCUSSION.

The terms of reference [*vide* agenda item V (1)] were "The adoption of uniform regulations for the prevention of the introduction into Southern and Eastern Africa of small-pox from India".

This question had been referred by the Conference to a sub-committee composed as follows:—

Dr. Gilks (Kenya)—Chairman.  
 Dr. Smith (Zanzibar).  
 Dr. de Sousa (Portuguese E. Africa)  
 Dr. Park Ross (Union of S. Africa, Natal).  
 Dr. Scott (Tanganyika)—Rapporteur.

This sub-committee met on 15th, 21st and 22nd November and Sir G. Buchanan and Sir E. Thornton attended all the meetings.

Major-General Graham was asked to open the proceedings by making a statement. He summarised the history of the question at issue bringing the position up to the present date and touching on the rôle played by the Office International d'Hygiène Publique in the matter.

*Brief History:* The regulations which various countries closely concerned with the passenger traffic from India have enacted with a view to preventing the spread of the infection of small-pox by passengers from India vary considerably. The lack of uniformity in the regulations results in much inconvenience in practice to passengers and port authorities generally, and it is difficult to ensure that intending passengers comply with the requirements of the particular country to which they are proceeding. The Government of India considered that it would be to the general advantage if all the countries concerned were to agree to the adoption of a uniform set of rules on the subject. In October, 1930, they accordingly requested the India Office to ascertain whether the Governments of Persia, South Africa, Kenya, Tanganyika, Portuguese East Africa, Egypt, Zanzibar, France and

Italy, would be willing to frame a uniform rule prohibiting the landing at their ports of passengers from India unless they:

- (i) carry reliable certificates of vaccination performed not less than twelve days and not more than three years prior to the date of embarkation from India; or
- (ii) bear marks of having had small-pox previously;
- (iii) are insusceptible to vaccination or revaccination owing to previous successful vaccination or other cause.

2. Replies to this representation were received from Egypt, Zanzibar, Tanganyika, Italy, Persia, South Africa and Portuguese East Africa. A summary of these is given below:—

*The Egyptian Quarantine Board* agreed that the rule suggested by the Government of India would be suitable in normal times subject to the amendment of clause (iii) so as to read as follows:—

- (iii) bears positive signs of previous vaccination.

The Board thought that clause (iii) of the rule as drafted by the Government of India was too indefinite and left the door open to people morally recalcitrant to vaccination.

In times of epidemic, the Board wished to insist on the production of vaccination certificates from all passengers as in clause (i) of the rule suggested by the Government of India, since they considered that there was no guarantee of immunity in the case of persons covered by clauses (ii) and (iii) of the rule. Egypt being thoroughly protected against small-pox by compulsory vaccination applied to natives and Europeans alike, and having been free for several years from a single case of the disease, the Board wished to leave no possible loophole for the entry of the disease.

*The Government of Zanzibar* were willing to accept the proposal of the Government of India, subject to similar action being taken by other East African Governments, and on the understanding that the final judge as to whether a vaccination certificate was reliable, or whether a particular person was insusceptible to vaccination or revaccination, should be the Port Health Officer at the port of disembarkation. They thought it essential that, as at present, the Port Health Officer should have authority to detain any passenger in quarantine at a suitable sanitary station until the incubation period of small-pox had elapsed if he had reasonable grounds for doing so. In this connection they stated that a passenger from Bombay who subsequently died of small-pox in Zanzibar declared that he had not been vaccinated and had not even seen the medical practitioner of Bombay who was alleged to have issued the certificate of successful vaccination produced by him.

*The Government of Tanganyika* (Kenya and Tanganyika go. together for quarantine) preferred that all passengers from India should be required to produce a certificate of vaccination successfully performed not less than twelve days and not more than six

months prior to embarkation. They suggested this course because, in the opinion of their Director of Medical and Sanitary Services, it was generally possible to determine from the condition of the scar whether successful vaccination had been performed within six months, but it might be very difficult to ascertain this if the scar was a year or more old.

*The Government of Italy* agreed that three years should be the maximum period prior to embarkation within which vaccination should be carried out. As regards the proposal that vaccination should be carried out not less than twelve days prior to embarkation, they reserved their opinion until the decision of the Small-pox Commission of the Office International on this point was known.

*The Government of Persia* accepted the proposal subject to the following observations:—

- (i) That passengers arriving from the ports of India should carry reliable certificates of vaccination against small-pox showing that the said vaccination had been performed within a period of not less than twelve days and not more than three years prior to the date of embarkation from India. It must, however, be mentioned in the certificate that the vaccination had a positive result (has proved successful), since it might happen that a person vaccinated some two years previously was at that time immune from the disease and the vaccination therefore did not take, but in the course of two years he may have ceased to be immune.
- (ii) That in normal times when a person bears marks of natural small-pox the vaccination certificate might be dispensed with; but in time of epidemics those who have suffered from small-pox should be vaccinated since even the fact of having marks of natural small-pox does not give entire immunity from the disease for a whole lifetime. It has been often observed that such people have again been attacked by small-pox.
- (iii) That persons who have been previously vaccinated or on whom, for satisfactory reasons, the vaccination has not been taken, will only be admitted if the revaccination be not more than one month nor less than twelve days old; this stipulation holds good even in cases where the vaccination has proved unsuccessful.

*The Government of the Union of South Africa* accepted conditions (ii) and (iii) of the proposal contained in this Department letter No. 359-IL (G.), dated the 6th October 1930: but they were not prepared to accept condition (i) because they thought that the period of certificates of successful vaccination should be 'not less than sixteen days and not more than three years prior to the date of embarkation from India' against the period of 'not less than twelve days and not more than three years prior to the date

of embarkation from India ' proposed by the Government of India. The reason given by the Union Government in support of their attitude was that several cases of small-pox had occurred in the Union on the 14th day after vaccination. Otherwise they were prepared to alter the existing regulation.

*The Portuguese Government* stated that the means of protection to be adopted against the introduction of small-pox originating in India were regulated in the Portuguese Colony of Mozambique by the prescriptions laid down in the International Convention of Paris of the 21st June 1926.

Procedure for the passengers disembarking at the port of Lourenco Marques and proceeding to their destination in the Union of South Africa by the land frontier the Port Health Officer draws up a list showing:—

- (a) those passengers who had been vaccinated successfully against small-pox;
- (b) those who had been vaccinated or revaccinated without success, and the reasons for the failures;
- (c) those who had not fulfilled the above conditions. These are vaccinated and remain under sanitary supervision for 14 days and are only allowed to continue their journey at the end of that time;
- (d) certificates of the disinfections effected. This list is then forwarded to the British Consulate.

The Portuguese Government are of opinion that these measures could be replaced without any inconvenience as regards the sanitary protection of the ports, by the three rules suggested by the Government of British India, which would enable the rigorous measures contained in (c) above to be alleviated, provided that the Indian Health authorities, in some sure manner, prevented the embarkation of emigrants who were not in possession of proper vaccination certificates.

*The Colonial Office* in their letter "Despatch Miscellaneous" dated the 30th June, 1931, to the Governments of Kenya, Tanganyika and Zanzibar stated that the proposals of the Government of India were generally acceptable, subject to an understanding that supplementary enquiries might be made in ports of disembarkation, in special circumstances or as a means of controlling the efficiency of the system. The Colonial Office accordingly suggested to these Governments to proceed on the above lines in the cases of all passengers arriving from India in the future. The Government of Tanganyika have actually given effect to the proposal.

*Present position:* Major-General Graham then recapitulated the various phases of this question explaining the nature of the error made by the Office International d'Hygiene Publique in substituting for "reliable certificates of vaccination" the words "certi-

ificates of successful vaccination", the course he had taken with the "Office" in asking that this interpretation be altered unless it was agreed that it be interpreted so liberally as to include unsuccessful vaccinations performed on immunes; and the final result which was embodied in the proces-verbaux of the May 1932, page 123, session of the "Office".

He further explained how this last statement had not reached apparently the Government of the Union before it was resolved to discuss the matter at the Cape Town Conference and he contended that the whole question at issue resolved itself into whether the Government of the Union of South Africa was prepared now:

- (a) to accept this final statement by the Office International d'Hygiene Publique, i.e., that the vaccination or re-vaccination should be not more than three years and not less than twelve days before embarkation,
- (b) to agree that certificates of vaccination or revaccination of a sufficiently reliable character be accepted.

If so then the only question remaining would be for Government of India to agree to explore every avenue possible in order to ensure the reliability of the vaccination certificates.

*Rapporteur's memorandum:* Dr. Scott as Rapporteur had circulated a typed memorandum to form a basis for discussion copy of which is attached (*vide* Appendix 23) but the main ground had already been covered by Major-General Graham in his introduction of the subject. This memorandum, however, helped to precise the issues and to clarify the subsequent discussions.

*Dr. Park Ross*, Assistant Health Officer for Natal in the Union of South Africa, under whom comes the work of the Port Health Officer, Durban, submitted a typed memorandum, copy of which is annexed (*vide* Appendix 25) and gave an expose on the situation from the Union point of view. Various aspects of this were challenged by Major-General Graham, but there is no proces-verbaux of the proceedings of this sub-committee.

Much was made by the Union delegate of the fact that India had not yet ratified the Convention: but appeared anxious to claim any advantages in regard to maximum measures which signatories had a right to expect. In the discussion South Africa's attitude to the colour question obtruded. In a highly protected country they insisted on the need for drastic measures amongst the coloured population especially as concealed cases of small-pox had been discovered amongst the lower class Indian population which gave them much trouble. European standards were obligatory and these regulations, though perhaps drastic, were not more so than those of United States of America and Australia. The "Certificate" bugbear was touched on verbally in his memorandum; also the need for the vaccination of supplementary Indian crews. General Graham reviewed the Union regulations and gave explanations regarding registered practitioners and their certificates and regarding the difficulties connected with official countersignatures.

Dr. Ross asked for definite evidence on the certificates of (1) the results of revaccination, (2) the nature and quality of the lymph used, (3) the status of the signing practitioner and Major-General Graham made further explanations regarding the difficulties of meeting these.

The Portuguese delegate stressed the necessity for reliability in the vaccination certificate as this was the weak point. Other delegates expressed their approval generally of the position as outlined by General Graham, especially in view of the assurances which he gave that he would do his utmost to try to enhance the reliability of the certificate through the action of the Central and Provincial Governments. Finally a report was drafted and this was submitted to the Plenary Conference on 24th November and adopted: It is as follows:—

At the first Plenary Session of the Conference the Committee on Small-pox was constituted, the members being—

Dr. J. L. Gilks.

Dr. W. H. Smith.

Dr. J. de Sousa.

General J. D. Graham.

Dr. G. A. Park Ross.

Dr. R. R. Scott.

Sir G. Buchanan and Sir Edward Thornton attended all the meetings.

(2) At its first session to elect office bearers the Committee elected—

Dr. J. L. Gilks—Chairman.

Dr. R. R. Scott—Rapporteur.

(3) Subsequently, meetings were held on Monday and Tuesday, 21st and 22nd November, 1932, at the first of which the Chairman read the terms of reference, which were—

“To consider the adoption of uniform regulations for the prevention of the introduction into Southern and Eastern Africa of small-pox from India.”

(4) It was pointed out that the question had arisen owing to the different requirements of the East and South African Governments in respect of vaccination of immigrants. Such immigrants had in the past been responsible for outbreaks of small-pox on board ship, and in their country of destination—sometimes having travelled on healthy ships, arriving within the period of incubation.

(5) The correspondence which had taken place in an effort to secure agreement on the points in question between the Governments of the United Kingdom, India, South Africa and the Colonies was mentioned—as also were the discussions at the Permanent Committee of the Office International d'Hygiène publique.



(6) The Paris Convention of 1926 (which has not yet been ratified by the Government of India) provides for the conclusion between Governments of agreements as to the preventive measures to which emigrants shall be submitted in the country of departure, so as to ensure that medical rejections on arrival may be reduced to the fewest possible (Articles 21 and 57).

(7) Full discussion eventually secured unanimity on the question of what would secure protection of an individual from small-pox, *viz.*, vaccination effectively performed not less than twelve days nor more than three years previously, or a previous attack of the disease. It then remained for the authorities at the port of embarkation to evolve such administrative procedure as would secure that emigrants should be in a protected state before embarking, which would afford security both to the ship in which they travelled and to the country of destination.

(8) It was agreed that the Health Officer at the port of disembarkation had full discretion to inquire into and act in accordance with his judgment as to the protection of and as to the sanitary guarantees available in any individual case; for the Convention provides that each Government shall determine the procedure to be applied in its own ports to arrivals from any foreign port (Article 15). Thus arises the question of what evidence of protection the Port Health Officer shall require from intending immigrants from India.

(9) Memoranda dealing with existing and proposed procedure were circulated to members of the Committee, and it became obvious that some form of certificate must be evolved which would afford reliable information indicating the protection possessed by the individual, and which would be as proof as possible against the various abuses described as common among the class of deck passenger mainly concerned in the case. It was made clear that the persons among whom virulent small-pox had most frequently occurred were persons of the poorer class, who tended to conceal the disease when it appeared; and that they, as a class, were the persons whose sanitary guarantees were usually unacceptable. Although such persons are usually Indians, racial discrimination does not enter into the question.

✓(10) The difficulties in regard to medical certification in India were described, and various proposals for countersignature by health officers of the certificates of vaccination issued by private practitioners were discussed. In this connection it is important to note the amended resolution of the Permanent Committee of the Office International at their session in April-May, 1932 (*Procès-verbaux*, page 123), to the effect that facilities should be given to every passenger—

(a) if he carries a certificate of vaccination or revaccination issued by a doctor attesting vaccination not less than twelve days and not more than three years before the date of departure; or

(b) if he shows scars proving a previous attack of small-pox.

In this connection the word "doctor" is understood to mean a registered medical practitioner.

It was explained that a former wording requiring a "successful" vaccination, was due to a mis-interpretation, which had led to misunderstanding.

(11) It is believed that in so far as any certificate can be regarded as evidence of vaccination, a certificate in the form suggested would be acceptable if its reliability could be assured; but in this connection it will be realised that the origin of a certificate issued by a private medical practitioner in a foreign country cannot be verified by the health officer at the port of disembarkation: and some system of official authoritative verification before embarkation is necessary—in order to ensure that the individual carrying the certificate is in fact the person to whom it relates, and that the certificate itself has been issued by a registered medical practitioner.

The Delegate from India pointed out that the countersigning of a certificate issued by a registered medical practitioner in that country might give cause for offence in certain quarters. He was, however, prepared to request his Government to consider any additional measures which could be taken to ensure as far as possible the reliability of the certificates of vaccination issued to passengers proceeding to the African coast.

(12) In the case of infants born during the voyage, as in the case of alleged loss of certificate, the action to be taken will necessarily be decided by the Port Health Officer at the port of arrival.

(13) It is important that the protection by vaccination of the crews of vessels plying between India and Africa should be ensured (Article 43).

(14) The desirability of linking up certification of vaccination with the passport system was pointed out, and it is considered that the proposal should be further explored.

(15) To summarise:—

The Committee agreed that it was desirable to prevent persons who may be infected with small-pox from embarking on ships. The East and South African Governments are concerned to allow only the immigration of persons who are protected from small-pox.

The conditions considered to confer protection are described (paragraph 7).

The final decision as to the protection enjoyed by an individual rests with the Port Health Officer at the port of disembarkation, but reliable certificates may assist him to decide in individual cases; he will exercise his discretion also in the case of infants born during the voyage, and in other exceptional circumstances.

The validity of certificates not issued by the health authority should be officially attested before embarkation, if they are to be of value to the health authority at the port of disembarkation.

It was agreed between Major-General Graham and Sir Edward Thornton that the first move in correspondence in regard to the position as now agreed on would be made by the Medical Department of the Union Government who would report the findings of the Conference to the Union Government for further necessary action with India and the East African countries.

### LEPROSY.

This was considered by a Sub-committee which met on November 15th, 19th, 23rd and 24th and drafted a report which was presented to and adopted by the Plenary Conference on November 25th.

The Sub-committee was opened by a general statement from Dr. Willmot (the Rapporteur) regarding leprosy in the Union (Appendix 21) and was followed by a series of statements from each of the members regarding this problem in their respective areas.

Dr. Willmot envisaged certain difficulties in accepting the classification laid down in the Manila report. As Chairman and as a member of the Manila Conference, I was not satisfied, however, that a real attempt had been made to do this by an expert leprosy clinician as the objection seemed to hang on the inability of Dr. Wade of Culin Leprosy Settlement, Philippines, who was a pathologist, to classify certain South African leprosy cases during his recent visit to South Africa. The sense of the meeting was with me as Chairman in accepting the work of the Bangkok and Manila Conferences. The point of view of the Union of South Africa had therefore to be met by recording their objection and difficulty. The accompanying report brings this out clearly and contains certain general observations likely to be of use to administrative officials in dealing with leprosy in South Africa.

#### *Report (abridged) (vide Appendix 22).*

*General:* From the ensuing discussion, it was clear that the leprosy policy problem and practice in the various Regions of Africa varied within very wide limits.

*Bangkok Report:* After discussion, the summary and conclusions contained in this report were found to be acceptable to all members.

Members, while accepting the view that isolation of infectious cases is one of the necessary measures in prophylaxis of the disease, are of opinion that a comprehensive system of effective isolation of all infectious cases is, in certain of the large Regions of Africa, not at present a practicable proposition.

Members desire to emphasise that any system of compulsory isolation of cases of leprosy must be imposed with discretion, bearing in mind not only the public health and social interests of the community at large, but also the effect of such measures on the Native mind and the danger of undue rigidity causing Natives to hide cases which may be highly infectious.

Any form of propaganda, especially amongst Natives, and any measures which will encourage Natives to report early cases of leprosy, should be encouraged to the utmost.

Apart altogether from the question of discharge from leper institutions of arrested cases of the disease, members are in agreement that the cases or types of leprosy which may be regarded as "closed" and which, while still showing clinical evidence of active leprosy are nevertheless free from bacilli, should not be compulsorily detained in any leper institution.

*Manila Report:* Members are in agreement generally with the views expressed in conclusions of the report. All are agreed as to the desirability for uniformity of methods and terms in such matters as the designation of cases, lesions and nomenclature.

With regard to the classification suggested in the report, members were informed that there are certain sub-types of leprosy in South Africa which do not fit in with the proposed classification. The matter is, therefore, still under consideration by the Union Government. The other members are prepared to accept the classification referred to.

*Medical Treatment of Leprosy:* In practically all areas some form of chaulmoogra oil treatment is in use. Iodised Ethyl Esters are being tried out in several of the areas, and in two of them, namely, in the Union and Nigeria, this preparation is being successfully manufactured in the manner prescribed in the Manila report.

*Evaluation of Terms:* While the majority of members are in agreement with the definitions of "active cases", "quiescent cases", and "arrested cases", the South African delegate holds the view that the definition of an "arrested case" should receive further consideration in the light of South African experience, which goes to show that in many cases the period can be reduced to one year, provided the bacteriological examination over the yearly period is carried out monthly.

All members are agreed as to the necessity of abstaining from making use of the word "cure" as applied to leprosy.

*Conclusions:* At the outset it was stated that anti-leprotic activities and measures in operation in different African States varied considerably. The reasons for this are to be found in the fact that, apart from the incidence of disease and other factors, the public health problems and the magnitude of such problems, particularly in Africa vary very widely, and Health Administrations dealing with such matters as Yellow Fever, Plague, Malaria,

Yaws, Syphilis, Sleeping Sickness and Tuberculosis, can only assign such energies and expenditure to leprosy as the disease warrants, in view of its relative importance to other problems with which they are faced.

The recommendations contained in these reports can, therefore, only be applied to any of the African States to an extent which the public health, local needs, conditions, machinery and financial resources pertaining to the country concerned justify.

### RURAL HYGIENE.

The Sub-committee on Rural Hygiene met on 15th, 17th, 18th, 22nd; and on 23rd November the report was presented to and adopted by the Plenary Session.

As Chairman of this Sub-committee, I realised at once how difficult it would be, in view of the diverse local conditions obtaining, for any Sub-committee such as this to formulate for African guidance any useful detailed programme of procedure. All that could reasonably be expected of it was to formulate for guidance some basic principles which might be generally applicable in Africa.

A very interesting statement by Dr. Duff of Accra was submitted (*vide* Appendix 28). It dealt with "The present position on the Gold Coast of the problem of training African medical assistants for work in Rural Dispensaries.

A memorandum by the Medical Association of the Union on "Medical Services for Rural areas" was also circulated (*vide* Appendix 29). This presented a point of view which was strongly supported in the Union, but one which would not meet with general acceptance outside the Union.

The meetings, which were well attended by other delegates in addition to the members of the Sub-committee, were very instructive. The Sub-committee was fortunate in having the services as Rapporteur of Dr. Orenstein who as a non-official had specially studied the subject in relation to the Johannesburg mines. As a result a report was drawn up which, after a few minor amendments, was adopted.

This report dealt with general considerations affecting the African countries and more especially with the preventive and curative functions of the field personnel, the co-operation between Government departments, the economic status of a community in its bearing on public health, education in hygiene, Native and European staffs, and missionary activities. For further details reference should be made to the full report (see Appendix 30).

### DANGUE.

The Sub-committee on Dengue met on 15th and 21st November and its report was presented to and adopted by the Plenary Con-

ference on November 25th. It dealt mainly with the acceptance by the African Colonies and Union of the Convention for combating Dengue Fever as adopted by the Office International d'Hygiène publique in Paris and a copy of which had been circulated.

The report, which was commendably brief (*vide* Appendix 31), stated that "After consideration of the position regarding Dengue Fever, epidemic and otherwise, in the countries named, the risks of conveyance of the disease, the conditions imposed by the Convention, and cognate matters, this Committee finds subscription to the Draft Convention advisable on the part of the countries named, and recommends the Conference accordingly".

25th November 1932, Afternoon.

Certain resolutions were then adopted (*vide* Appendix 32).

The Conference placed on record its thanks to the Government of the Union of South Africa for the generous hospitality which it had extended to the delegates.

The Conference found that through the courtesy of Mr. Speaker and the Clerk of the House, most suitable accommodation had been provided at the House of Assembly for its meetings, and that in this and all other ways much thought had been given by the Union Health Department to details which would facilitate the conduct of its business and meet the convenience of Delegates. The Conference expressed its grateful appreciation of these facilities as well as the consideration which the Delegates had received from the Mayor and Town Council of the City of Cape Town, the Chairman and Members of the Divisional Council of the Cape, the University of Cape Town, the South African Medical Association (B. M. A.) and other hosts.

The Conference expressed its gratitude for the complete arrangements made by the Public Health Department of the Union and also for the carrying out of the secretarial and clerical duties.

On almost every one of the subjects dealt with, notably in the case of Yellow Fever and Plague, further information or new developments calling for action by public health authorities, and having international importance, are likely to need attention in the near future. For this reason, and since the experience afforded of the advantages of personal discussion between responsible officials of neighbouring Territories in Africa has been so strikingly shown by the present Conference, the Delegates considered it desirable that a similar Conference should be convened after an appropriate interval, and that the League of Nations should be invited to take steps, not later than 1935, to ascertain the wishes of Administrations concerned in this matter.

The Conference was then declared closed.

## COMMENTS.

1. Though an efficient shorthand writer was present and recorded everything, no official *proces-verbaux*\* will be published. The full report of the Conference will be published in Geneva in both English and French at an early date.

2. The Conference was essentially concerned with African territory and India was only directly concerned in regard to small-pox, plague and yellow fever. My opinion was, however, frequently sought in regard to Indian experience and procedure (*e.g.*, plague, leprosy, etc.).

3. In view of (2) above I demurred to taking an active part in the Sub-committees, but was overruled and had to attend all and be Chairman of two.

4. The general arrangements were excellent; as were the Secretarial arrangements under Dr. Park, Mr. Stewart, and assistants. The fact that all the delegates were housed in the Mount Nelson Hotel facilitated greatly the work and discussions both inside and outside of the Conference. We were the guests of the Union Government till the Conference terminated.

5. Much official and private hospitality was shown to the delegates including a banquet by the Union Government, a lunch by the Vice-Chancellor of the Cape Town University, an invitation to an official reception by the Mayor and Mayoress of Cape Town, a dinner by the South African Medical Association and excursions to Cape of Good Hope and Steenbrass Water Works on the two Sundays.

6. Yellow fever was the most important subject dealt with, followed by plague, small-pox, leprosy, rural hygiene and dengue.

7. The pronouncement on the present position of yellow fever in the world is probably one of the most important ever made on the subject and will no doubt be regarded in the future as classical.

8. The experiences of men who had had yellow fever and who had dealt with it clinically and scientifically over many years was of primordial importance in enabling others less favourably situated to appreciate the situation.

9. The presence at the discussions of the representatives of non-infected territory in Central, Eastern, Southern, and Western Africa was of the utmost value in precisising for them the exact position, the dangers, and the course of action recommended by the experts for their consideration and immediate execution.

10. The attempt to control its spread by rapid transit by air by means of a Convention (A. S. C., 1932) was carefully examined and the adoption of the draft Aerial Sanitary Convention was generally approved by all the African territories represented.

---

\* One has been circulated confidentially in draft and I have obtained a copy of it.

11. The position taken up by Government of India regarding yellow fever and the Convention was clearly and unequivocally stated by Major-General Graham. India's position in this matter is less urgent at present than is that of the Eastern and Central African buffer territories; but what have been laid down by the experts as immediate essential measures for them should also be undertaken by India at an early date so that she may be prepared should necessity arise. At present the danger though real is remote.

12. The evidence recorded and conclusions arrived at should enable Government of India to formulate a definite policy in regard to the new Aerial Sanitary Convention and its ratification; but it was obviously a disappointment and surprise to most African representatives to find that Government of India had not yet ratified the I. S. C., 1926.

13. The non-ratification of the I. S. C., 1926, which had to be brought up in connection with the small-pox discussions was made much of, both in regard to measures against arrivals from India who might be potential small-pox cases, and in regard to rat infestation,—potentially plague carrying,—on ships from ports like Bombay.

14. A working arrangement was arrived at for small-pox control whereby the Union of South Africa is prepared to accept the recent vaccination and revaccination standards as laid down by the International Bureau in Paris; but insists on greater reliability of the certificates of vaccination and on the exploration by Government of India of every reasonable means to this end.

15. The Plague, Leprosy, Small-pox and Dengue reports were mainly concerned with African conditions and circumstances.

16. The contacts made were, as they usually are, of the greatest value not only between African administrative officers but between them and myself; while the pleasure and value of being closely associated with such an expert as Dr. Sawyer of the Rockefeller Foundation were much appreciated by me.

17. I feel sure that any future incidents which may arise in connection with port health work between India and East Africa and more especially Zanzibar, Dar-es-Salaam, Portuguese East and the Union (Natal, Durban) and which require an exchange of view will be able to be settled directly by technical correspondence without recourse to correspondence through Governmental and diplomatic channels as has been the case lately.

18. I think the Conference has been justified by its results; it has been run cheaply so far as the League of Nations is concerned: and it is, in my opinion, likely to be repeated in three or four years time if not earlier, in view of its yellow fever pronouncements and the desirability of their continuance.



19. I was able, as instructed, to keep in touch with the Agent-General for India and to give him an indication of the purport of our discussions and conclusions.

20. I would take this opportunity of thanking the Government of the Union for their hospitality to the Indian delegate during the Conference and would suggest that Government of India be moved to thank the Union Government for this.

J. D. GRAHAM,  
Major-General, I.M.S.,  
*Public Health Commissioner with the  
Government of India.*

*New Delhi, 31st January 1933.*

## LIST OF APPENDICES.

NOTE.—Reports marked thus (\*) are reproduced in full in the body of the Report or in the Appendices; all other Reports mentioned in the Appendices are filed in the Office of Public Health Commissioner.

*Memorandum distributed, Reports of Committees, Annexes.*

## YELLOW FEVER.

1. Note to Health Committee, League of Nations, No. C. H. 1107, dated October 11th, 1932, by Sir Geo. Buchanan on the Cape Town Conference.
2. Report by Yellow Fever Commission to Permanent Committee of Office International d'Hygiene publique on Recent Knowledge of Yellow Fever (adopted October 22, 1932, by the Committee for transmission to Governments concerned in accordance with its resolution at Session May, 1932).
- \*3. Note on "Present Knowledge of Yellow Fever as it relates to the problem in Africa", by Dr. Sawyer, Rockefeller Institute, New York (included in the text of my Report).
- \*4. Rockefeller Commission Schedule for blood examination, by Dr. Sawyer.
- \*5. Note on "Yellow Fever Control on the Gold Coast and the present situation", by Dr. Duff, P.M.O., Gold Coast (included in the text of my Report).
- \*6. Note on the Discussions on the Air Sanitary Convention, by Sir Geo. Buchanan.
7. Yellow Fever problem as it affects Tanganyika, by Dr. Scott, Senior Health Officer, Dar-es-Salaam.
- \*8. Aerodrome Map and Schedule.
9. Yellow Fever in Angola, by Dr. A. Damas Mora, Chief Health Officer, Angola.
- \*10. Report of discussion on Dr. Sawyer's memorandum (item 3).
- \*11. Report of discussion on Sir Geo. Buchanan's exposé on the Air Sanitary Convention (item 6).
- \*12. Report of discussion on Dr. Duff's memorandum (item 5).
- \*13. Final Report on Yellow Fever, by Dr. Johnson (Rapporteur) as adopted by the Conference (included in the text of my Report).

## PLAGUE.

14. Position in regard to Plague in the Union of South Africa, by Sir E. Thornton, Secretary for Health, Union of South Africa.
15. Memorandum on the Plague situation in Ovamboland, by Drs. Fournier and Hinsbeck, South-West Africa.
16. Union of South Africa, Bulletin No. 317, Health on Plague Rodents and Rodent Destruction.
17. Union of South Africa, Bulletin No. 321, Health on Rodents (Powell).
18. Plague epizootic in South Angola, by Dr. Damas Mora, Director of Health and Medical Services, Angola.
- \*19. Anti-plague Vaccination appraisal, by Dr. Morgan, Ministry of Health (prepared for Office International in Paris).
- \*20. Final Report on Plague, by Dr. Lee (Rapporteur), adopted by Conference.

## LEPROSY.

- \*21. Leprosy in the Union of South Africa, by Dr. Willmot, Assistant Health Officer of Union of South Africa.
- \*22. Report by Sub-Committee on Leprosy as adopted by the Conference.

## SMALL-POX.

- \*23. Memorandum for discussion by sub-committee, by Dr. Scott (Rapporteur).
- \*24. Summary and exposé. by Major General J. D. Graham, Public Health Commissioner with the Government of India (*included in the text of my Report*).
- \*25. Memorandum on Precautions against small-pox at the Port of Durban, by Dr. Park Ross, Assistant Health Officer for Natal, Union of South Africa.
- \*26. Report of Sub-Committee on small-pox as adopted by the Conference (*included in the text of my Report*).

## ANIMAL DISEASES.

- 27. Transmission of animal diseases by aeroplanes, by Dr. P. J. du Toit, Director of Veterinary Services, Union of South Africa.

## RURAL HYGIENE.

- 28. Note on the present position on the Gold Coast of the problem of training African medical assistants for work in rural dispensaries, by Dr. Duff.
- 29. Memorandum on medical services for rural areas—especially native areas, by the Medical Association of the Union.
- \*30. Report by the Sub-Committee on Rural Hygiene (Dr. Orenstein Rapporteur), adopted by the Conference.

## DENGUE.

- \*31. Report of the Dengue Sub-Committee, adopted by the Conference.

## RESOLUTIONS.

- \*32.

## APPENDIX 4.

*Information about Specimens of Blood or Serum sent for Examination for Protective Power against Yellow Fever.*

Sender \_\_\_\_\_ Date \_\_\_\_\_

Address of sender

Report to be sent to

Date of sailings

Ship carrying the specimens

Locality from which the specimens were obtained

[illegible]

**COMMENTS:**

**Signature of Sender.**

YELLOW FEVER LABORATORY OF THE INTERNATIONAL HEALTH  
DIVISION, THE ROCKEFELLER FOUNDATION, 61. BROADWAY,  
NEW YORK.

*Directions for Collecting and Forwarding Sera for Tests for Protective Power against Yellow Fever Virus.*

1. *The Protection Test.*—An attack of yellow fever produces a permanent immunity. Immune bodies are present in the blood serum in appreciable quantities, and their presence can be shown by the protection test, that is,

a small quantity of serum from a person who has had yellow fever will protect a rhesus monkey or a mouse against a lethal dose of yellow fever virus.

2. *Source of Specimens.*—The reasons for making protection tests are: (a) to assist in epidemiologic studies by determining whether yellow fever has been present in a region or (b) to find out whether a recent illness was yellow fever.

To determine whether yellow fever has been present, blood serum should be secured from not less than 25 persons in each locality. The 25 persons should be a fair sample of the whole locality and not merely of one part of it, and they should be permanent residents of the locality who have not lived temporarily elsewhere.

On the first survey, as a rule, specimens should be collected only from children under ten years of age. If none of these sera is found to have protective power, additional specimens may be obtained later from older persons. These additional sera will show if yellow fever has been present during the life of the present generation.

The blood from convalescent persons should be drawn not less than two weeks after the beginning of the attack suspected to be yellow fever. Specimens should not be sent from persons sick with suspected yellow fever for the purpose of making a diagnosis. Diagnostic tests by inoculation of monkeys can sometimes be made with a yellow fever laboratory near at hand. The blood in the early stages of the disease is extremely infectious, and infectious blood should not be sent except under instructions from the laboratory.

Each specimen should be accompanied by the following data: (1) Name of physician who obtained the blood. (2) Name of person furnishing blood, age, sex, color, race or tribe, and name of locality. The form on the back of this sheet may be used for recording these data.

3. *Obtaining and preparing the Serum.*—A. With the help of a Laboratory. Cleanse thoroughly the skin over a vein at the elbow with 70 per cent. alcohol. Withdraw 20 cc. of blood with a sterile needle and syringe and eject it into a sterile test tube or flask. Take the specimen to the laboratory, allow the blood to clot, and transfer the serum with a pipette to a sterile test tube. If possible, seal the mouth of the tube in a blast lamp. If this cannot be done, close the tube with a sterile cotton plug and melted paraffin, or a sterile rubber or cork stopper firmly fastened with wire or string. Label each tube with the name of the person bled and an identifying number. Pack the tubes of serum tightly in a box with much soft material, making sure that the ends of the tubes are not near the walls of the container. (If preferred, the serum may be prepared by defibrinating and centrifuging the blood. The serum may be sent in sealed ampoules instead of test tubes.)

B. Without the help of a Laboratory. Prepare the skin over a vein as directed in paragraph A, and withdraw the blood with a 20 cc. or 30 cc. vacuum tube with a sterile needle attached. Vacuum tubes may be purchased which will close automatically after filling and will remain sterile. If vacuum tubes containing glass beads are used, the blood may be defibrinated by shaking, and this will save much time in the laboratory. Pack the tubes as directed under A.

4. *Sending the Specimens.*—The specimens should be cooled soon after collection and should be kept cool during shipment, preferably at refrigerator temperature. If stoppers or paraffined cotton plugs are used, the tubes should be kept upright and the tops of the boxes should be marked "THIS SIDE UP".

The laboratory should be informed of the shipment by cable and by letter so that steps can be taken to receive the specimens on arrival. The cable message should state the nature of the shipment and the name of the ship; the letter should give the number of specimens, the name of the

ship, the date of sailing, and any important information not on the form with the specimens. The shipping papers should be enclosed with the letter.

Unless otherwise instructed, ship the specimens on bill of lading or steamship company's parcel receipt, to—

The Rockefeller Foundation,  
International Health Division,  
61, Broadway, New York, N. Y.  
United States of America.

5. *Reports of Results.*—It takes from two to three weeks to perform the protection tests, and Reports cannot, therefore, be mailed until approximately three weeks after the receipt of the specimens.

## APPENDIX 6.

REGIONAL HEALTH CONFERENCE—LEAGUE OF NATIONS.  
CAPE TOWN—NOVEMBER, 1932.*Note by Sir George Buchanan regarding Discussions on the Air Sanitary Convention.*

Various explanations were requested and questions answered on the general principles and particular Articles of the International Sanitary Convention for Aerial Navigation, 1932. These hardly call for comment on record, as the information given followed the lines which had been frequently considered and discussed during the preparation of the drafts at the Office International d'Hygiène publique or at the departmental conference in London.

The following are notes of the points to which these questions seemed principally to relate:—

(1) The nature of the obligations undertaken by Administrations signatory to the Convention:—Some Delegates seemed apprehensive lest they would be obliged to make detailed regulations which embodied the precise terms of the different Articles of the Convention. For example, they noted that, in relation to a sanitary aerodrome, Article 5 requires "a proper and safe system for the removal of excreta and refuse, and for the disposal of liquid waste". They pointed out that strict legal interpretation of this requirement might mean that excreta and refuse were obliged to be taken out of the aerodrome altogether, e.g., by water-carriage system. Was this necessary? and would complaints be received from other countries that the provision actually made did not conform to the letter of the Article? In this connection Dr. Orenstein pointed out that the English word "removal" is not the exact equivalent of the French "enlèvement".

Another point of the kind was the requirement in Article 38 (2) that at the anti-amaryl aerodrome the destruction of mosquitoes should be undertaken in "all stages of growth". It was said that this was an unsatisfactory phrase, because the adult stage is not a stage of growth at all. For any regulations a better term should be found—assuming that these regulations need not exactly reproduce the terms used in the Convention.

On all this I explained that the Convention constitutes a code of conduct and action, but that it rests entirely with the Administration to take the best means at its disposal to carry out the spirit of the Articles—and to adjust any local regulations accordingly. I gave the parallel of ordinary port sanitary regulations in regard to the Convention of 1926.

This reference to observance of the spirit of the Convention led, I ascertained, to a little misconception, and I amplified by meaning at the following sitting of the Conference. The point was to differentiate between Articles imposing obligations and the large sections of the Convention which are essentially facultative or which prescribe maximum measures. The signatory country is not, in the latter case, under any obligation to do anything at all: its signature means that if it takes action in regard to the arrival of aircraft from another territory, that action should be based on the Convention and should not exceed what the Convention requires.

On the other hand, there are in the Convention certain definite undertakings by Governments, which have to be carried out under the circumstances defined. If, for instance, a country finds that it has a region affected by yellow fever, then any aerodrome established in that region must be an anti-amaryl aerodrome; it must, in consequence, comply with the requirements of Article 38, although it would be for the Administration

itself to settle in what way the specific requirements should be met. Similarly, there would be the obligation to deal with all aircraft on departure, on the lines laid down by (1), (2) and (3) of Article 42. This, again, was to be accepted as a definite obligation for action in the circumstances named, and countries accepting the Convention would accept the obligation.

(2) The question of dependence on other countries was also raised, and it was pointed out that if the protection of an air-route depended on a chain of stations, the chain might be only as strong as its weakest link.

Delegates seemed to fear that the safeguard provided by the Convention might be little more than paper, if each country was itself entirely the judge of what was done. In this case, also, I made the distinction between the facilitative, or maximum, requirements and the obligations.

As regards the fulfilment of the obligations, I laid stress on the system which will doubtless be established at the Paris "Office", parallel to that by which the work of the Sanitary Convention of 1926 is already supervised. So far as yellow fever is concerned, the Convention requires aerodromes and infected regions to be notified to the Paris Office, so that there will be, as it were, an official centre and system of information on which examination of the working of the Convention can be regularly based. A country having reason to suspect insufficiency of action in other countries, would automatically have the opportunity of asking for explanations or information through the Office International d'Hygiene publique at Paris or its Committee. It could also do so by friendly communication between the Administrations concerned, and it seemed to me that, in practice, along any principal or trunk line use would be made of Article 58—enabling special Agreements to be made between particular contracting parties, to facilitate the working of the Convention. Such Agreements might very well include provision by which the representatives of the Health Services concerned might be able to visit aerodromes up the line and confer with their opposite numbers. Moreover, if any sudden and dangerous outbreak occurred in one particular country, in regard to which risk of transmission by air became obvious, I thought that the management of the Air Service would be only too willing to facilitate conferences between medical officers in regard to precautions to be taken. This I based on the favourable reception of a similar suggestion when I met the representatives of Air Services to discuss the draft.

(3) Attention was drawn, again on yellow fever, to the different phrasing of Articles 42 and 47—the latter referring to "possible exposure to infection". I explained that it had not seemed desirable to alter Article 47, since, as it related to action under conditions which would be quite exceptional, it might require a larger interpretation of "exposure to infection" than is the case with the regular duty imposed under Article 42 (2).

(4) Enquiries were made as to the application of Article 37 to the discovery of new regions or areas in which yellow fever is endemic by means of the new protection test. My interpretation was that countries would ordinarily communicate new information of this kind quarterly or half-yearly, in the same kind of way as we do in England regarding the dissemination and type of endemic small-pox.

(5) The circumstances under which Article 48 was amplified in May, 1932 (prohibition of entry of aircraft), were explained fully and emphasised by General Graham—for India, reference being made in this connection to the declaration made by the Committee of the "Office" at the same Session—that the justification required is a matter for the excluding authority to formulate and set upon.

(6) Some Delegates enquired about the penalties to be imposed for infraction of the rules of the Convention. It was explained that this was entirely a matter for the Administration concerned.

(7) It seemed desirable, in connection with several questions, to insist on the existing international system under the present Convention for Air Navigation; and otherwise, that aircraft coming from a foreign country must be controlled in respect of its place of first landing for Customs and



other purposes, and that the number of aerodromes open to entrance from abroad is a limited one.

The possible anomalies of the provision for the forced landing under the second paragraph of Article 25, were also drawn attention to, and on this I explained how the requirement had been based on similar requirements in the existing International Convention for Air Navigation in respect of contraband articles and so forth.

(8) The nature of the control of the entry and exit of persons to and from sanitary aerodromes, under Article 8, was discussed. I considered its meaning to be that the control must be an effective one, however obtained. It did not necessarily mean that the aerodrome must be surrounded by an unclimbable fence; its situation might permit of it being mainly controlled by guards or police, or even by natural features of the ground.

In general, the discussion and the explanations did not lead any of the Delegates to maintain that the provisions of the Convention were impracticable, or to dispute the value of the international system which it established.

General Graham said that the information given at this Conference by Dr. Sawyer had gone a long way towards meeting some *prima facie* objections which they had been inclined to take to the Convention in India, and he would take care to represent these new considerations to the Government of India.

Dr. Park read a letter from the Director of Health Services in the Dutch East Indies—to the effect that certain objections they had had to the original draft had now been sufficiently met, and that there now seemed to be no obstacle to the Dutch East Indian Government accepting the Convention.

Delegates representing the Eastern side of Africa were prepared to advise their Administrations to be parties to the Convention. As regards the West African Colonies, it was pointed out that at present there are no regular air-routes on international service through Nigeria or the Gold Coast, but it was understood not to be necessary or desirable to wait for the establishment of such routes before accepting the Convention. Acceptance of the Convention now would mean that on the establishment of an international air-route, aerodromes would have to be selected in accordance with the international system of that document—and this action in the case of yellow fever infected countries appeared to be essential for the success of the Convention.

Cape Town, 19th November, 1932.





## APPENDIX 8.

*Latest information in regard to air-routes received through the Director of Air Services, Union of South Africa.*

According to press statements, the air service between Belgium-France-the Congo and, later on, Madagascar, will be run fortnightly, as from October 1st, by the Belgian Company "Sabena".

It appears that the French Company "Sadan" will be unable to fulfil their original intention of running a line jointly with the Belgian Company. The inability of the French Company to carry out their engagement is attributed partly to financial considerations, but principally to the postponement of a decision on the question of the commercial aviation statute, on which the two French Chambers failed to reach an agreement before the end of the parliamentary session. It is stated that the extension to Madagascar, for which arrangements had been made with Portugal, cannot now be contemplated for October.

The Belgian line will run along the Spanish coast, as the Company does not possess a hydroplane capable of effecting a regular crossing of the Mediterranean.

It is not known how this will affect the Belgo-Portuguese arrangements.

## Tanganyika Territory.

Authorised Aerodromes (= Customs Aerodromes) Designated for first landing or departure attendance of a medical practitioner ensured.	Responsible M. O.	* Beyond all probable risk of infection (if to be designated local area).	Notes.	Sanitary Aerodrome* (a. a.) (to be designated as such).		
				Medical Officer and Sanitary Inspector on call.	Place for Medical Inspection.	Equipment for taking specimens.
Aeroplanes and seoplanes :—						
Dar-es-Salaam . . . . .	M. O. H.	3 miles from town.	No accommodation for personnel. Native attendants hut exists. Telephone. Main water 2 miles away.	..	Building available.	..
Tanga . . . . .	M. O. H.	..	Privately owned. Storage hut only building.	..	In town . .	..
Mwanza . . . . .	M. O. H.	..	Nothing . . . . .	..	In town . .	..
Aeroplanes :—						
Tabora . . . . .	M. O.	..	No buildings. Railway station adjacent and main water.	..	In town . .	..
Moshi . . . . .	M. O. H.	..	1 mile from town Permanent petrol store. Wireless.	..	In town . .	..
Arusha . . . . .	M. O.	..	5 miles West of town . .	..	Hangar only .	..
Vibaya . . . . .	S. A. S.	..	Imperial Airways Station. Rest House, Wireless, etc.	..	Buildings (I. A.) available.	..

\* To be notified : Articles 7 and 8.

Sanitary Aerodromes\* (a.n.) (to be designated as such).

Authorised Aerodromes (= Customs Aerodrome) (a. a.) Designated for first landing or departure attendance of a medical practitioner ensured.	Means within or in proximity for			Drinking water.	Excreta refuse and liquid waste.	Free front rifle.	Entry and exit controlled, Article 8.
	Isolation.	Transport.	Contacts.				
<b>Aeroplanes and seaplanes:—</b>							
Dares-Salaam . . . . .	..	Ambulance	..	No water.	No permanent arrangements.	Wild rodents present.	None are re- quired: and each would re- quire from one to three miles of fence- ing.
Langa . . . . .	..	†	..	Main water ad- joining.	..	No rodents likely to be pre- sent.	
Mwanza . . . . .	..	†	..	Lake 4 mile	..		
.. . . . .	..	..	No buildings are ready for re- ception of contacts but extemporised accommoda- tion can be arranged.	At Railway sta- tion 4 mile.	..		
<b>Aeroplanes:—</b>							
Tabora . . . . .	..	Ambulance	..	Main in town	..	No rodents likely to be pre- sent.	None are re- quired: and each would re- quire from one to three miles of fence- ing.
Vichei . . . . .	..	†	..	..	..		
Arusha . . . . .	..	†	..	..	..		
Mbeya . . . . .	..	†	..	River water piped.	..		

\* To be notified: Articles 7 and 8.

\* To be notified: Articles 7 and 8.

† Motor transport always obtainable.

## APPENDIX 10.

*Report of Discussion on Dr. Sawyer's Memorandum (item 3, Appendix and page 14 of Report).**Question.**Answer (by Dr. Sawyer).*

*Dr. Johnson's observations: (i) Value of protection test in children in a town.*—As children at four years of age and upwards were the useful limit for use in this test, it would be impossible to estimate an epidemic which was present by means of a protection test on young children.

Spot maps if done on children from 6/12 to one year of age may give a fallacious picture.

*(ii) Siting of sanitary aerodromes.*—Is it safer to site it in a negative area rather than in an area where yellow fever is endemic? "To relieve minds of importing country we in Africa consider it less dangerous to deal with known areas where disease is than an area apparently free, but about which we know nothing, *e.g.*, N. Nigeria. In French country, in Ausongo, Dosso and Gao, these were all negative by test, but further tests in and near towns of Tessawa, Birnin Kouni, Dogondutsi, etc., showed + protection tests and 50 per cent. + in children; and two or three other towns were much the same. Yet in such towns with evidence of recent infection no obvious yellow fever cases were known to have occurred. Therefore whole country is probably a risk. We should confine our international aerodromes to carefully controlled areas even though the disease has existed near them."

*(iii) Barriers.*—The high central African mountain barrier is important; but road routes present bigger risks than air routes, *e.g.*, motor roads from the Cameroons to Bangin and across the Belgian Congo and Lake Albert and the Soudan, and from Matadi to Uganda should be closely watched; opening of French Railway from Point Noire to Brasseurville is a possible risk owing to coastal people landing for the interior. The

(i) This is true. A similar test on children of 6 months or one year will give a very small picture of fever at any one time.

He agrees.

(ii) No site should be barred because of its proximity to an infected area.

A percentage protection was an advantage. The chances of having an explosive epidemic are largely eliminated by a reasonable proportion of immunes in the surrounding population and presence of a fair proportion of immunes should be regarded as a safeguard. Strict sanitary regimen was essential especially in all key places. Air control is practicable: Motor roads are the most dangerous avenues. Slow extension from village to village is a patent danger.

(iii) Every African is susceptible and will develop immunity; but the disease may be insignificant, *i.e.*, there is a + + resistance though immunity must be acquired. This + resistance may be from past experience and selection.

Matadi statistics are inadequate as they dealt with hospital patients only. Fulminant cases always occur in epidemics in a highly susceptible population."

## Question.

Matadi epidemic which was a new introduction possibly from Senegal was very fatal and severe in natives. Tests from here are now going on at Lagos to see if the disease is remaining. Protection tests should be made in Cameroons, the Congo and equatorial Africa.

(iv) *Protection vaccination*.—This is at present difficult on a large scale owing to the careful and difficult organisation needed to get sufficient suitable immunes.

(v) *Epidemiology in large towns* where we know disease is endemic. He has 7 or 8 towns with over 50,000 people, with yellow fever endemic and 50 per cent. showing + protection and yet Europeans or the yellow fever workers there do not get the disease; yet he does get cases in missionaries in dry areas with no apparent reason. Why is this? What further investigation can be made to study further that epidemiological factor?

(vi) Where were "Athons" dengue cases tested?

Sir E. Thornton asked regarding carriage of "Aedes" by motor cars as it was reported to be found in "Sedan" cars on the West Coast.

Dr. Park asked if the question of Dengue conferring immunity against yellow fever could be regarded as now disposed of.

Dr. Scott asked: (i) How many, if any, Europeans who have never been known to suffer from the disease have been found protected, e.g., case of a Secretary to Government who was not sure if he had had it or not.

(ii) Is it possible that there is an alteration in the virulence of the virus in different outbreaks?

(iv) Mass inoculation for natives is at present impossible though there is no difficulty for officials, traders, etc., Dr. Findlay is now doing this in London.

Time trouble and cost are essential, but man will sell his blood which is so much less toxic than animal blood.

(v) Danger is perhaps much less than we might suppose.

High immunity = therefore small mosquito infection (4 days' risk only) and therefore less exposure for individuals and therefore danger is much less than we may think.

Beukes experiment with 25 sera (total ages over 400 years) of people in yellow fever area and serum showed no protection, therefore long period in yellow fever area does not give immunity.

(vi) 22 in Lagos of which 21 were + and one inconclusive. No cross immunity. Dengue only protects against dengue for a few months and therefore it is difficult to believe that it can protect against yellow fever.

Observations regarding air craft will hold for motors and train though he knows of no experiments on this.

Schuffner says work is going on still in Amsterdam.

(i) Answered. If Secretary's blood is sent to Lagos, answer will be given.

(ii) No evidence. It is intriguing on basis of Alastrim especially as American and African strains are the same.



## Question.

(iii) Possibility of infectivity by persons by road. In this connection is Anglo-Egyptian Soudan population susceptible? Is any real communication taking place between French Equatorial Africa and Anglo-Egyptian Soudan and if so, what?

(iv) What African Governments (if any) have considered or are considering the prohibition of importation of yellow fever virus as has been done by India, Ceylon, N. E. Indies, F.M.S., Philippines, Australia, Formosa?

Dr. du Toit spoke regarding recent work (veterinary) on Horse sickness transmission to mice by the same methods as in yellow fever, this work having been stimulated by Theilers' work on transmission of yellow fever to mice which had incidentally been confirmed.

Sir E. Thornton gave some recent information regarding—

(a) Dengue immunity work in Amsterdam under Snyder,

(b) Carrier rôle of the monocytes in yellow fever cases and the question of a residual virus after recovery and that of possible carriers?

Dr. Gilks asked regarding immunity by Dengue and if any work had been done recently on Rift Valley Fever which in type is associated with yellow fever.

## Answer.

Differences in mortality are difficult to explain.

Missed cases exist in Europeans also, e.g., Lagos case.

(iii) We must know more regarding this region. *Prima facie* it is an easy area to control.

(iv) General principle is accepted, but discretion by administrative officers is preferable. Belgian Congo has prohibited it; but it should discriminate between areas most infected and those uninfected and perhaps uninfected. So should every country. Risks are with native assistants, but these can be eliminated completely by vaccination. He does not think that in future any of the staff of yellow fever laboratories will remain uninoculated.

Attenuated fixed mice virus cannot produce viscerotropic yellow fever virus in monkeys. Reason is obscure. As no slip is likely therefore, some laboratories could be permitted to work with it, without undue risks.

(a) No, cross immunity has yet been proved to exist in any case we cannot depend on it for protection.

(b) No such thing as a carrier is known, though residual virus may remain longer in the monocytes than in the serum as demonstrated by animal inoculation.

Findlay of London is working on this and has shown that there is no cross immunity with yellow fever. This is settled. In countries believed to be free from yellow fever occasional unexplained positive in immunity tests have occurred but rarely. Probably some individuals have non-specific immu-

## Question.

*Dr. MacLennan* asked if there was evidence of true racial tolerance, i.e., where epidemic is mild and protection tests are negative can it be shown in any way by animal experiments?

*Major-General Graham* asked for the latest information regarding Col. King's two + cases from Madras.

*Sir Geo. Buchanan* asked regarding—

(i) close proximity of infection.

(ii) Does entry of non-immunes increase the risks?

## Answer.

nity. If we do many hundreds of tests, sometimes by a slip in technique or by using unsuitable animals we may get a positive result where we should not.

Resistance is the thing with Negro. It is the same with the American Negro.

Nothing further had reached New York than that reported by him.

(i) Maximum flight of *stegomyia* = 400 yards on sea, about 100 on land (streets) or less usually; and therefore the vector is essentially "local".

(ii) Yes, e.g., San Paolo epidemic. Santa Cruz (Brazil) epidemic was due to removal of troops from the hills to lowlands. This was apparently a brand new outbreak; but no protection tests had been done.

The difficulty of estimating the amount of very recent yellow fever because young children cannot be tested is a definite limitation on the immunity survey method, but cannot easily be overcome except in very important cases.

## APPENDIX 11.

*Report of Discussion on Sir Geo. Buchanan's exposé of Air Convention (item 6, Appendix).*

## Question.

## Answer (by Sir Geo. Buchanan).

*Dr. Gilks:* (i) raised the question of Government implementing this document, if signed, by legislation, and asked if it should be interpreted in the letter or spirit only.

(i) Legislation probably not necessary because the administrative services would act; but, if any legislation were needed, it should be in the "spirit", just as is done under Port Sanitary rules.

(ii) Asked for the interpretation of "excreta and liquid waste" in Article 5 "Definition of a sanitary aerodrome".

(ii) This—a minor matter—was explained.

(iii) If the status of your sanitary aerodrome is questioned what will happen?

(iii) Very unlikely. Remedy is by letter to the Colonial Office (Dr. Stanton) and thence to "Office" International in Paris.

*Sir E. Thornton:* (i) Regarding Article 37. Shall we notify results of protection tests?

(i) Yes. Information will be circulated (*cf.* Small-pox and Ministry of Health proceduro).

(ii) Regarding Article 48 and its interpretation regarding South Africa and India?

(ii) India says that each country should justify its own action and the "Office" has accepted this interpretation.

*Dr. Johnson* regarding Article 39. Can a country sign before having made or completed any arrangements under the Convention, *e.g.*, Nigeria?

Certainly; but it should be prepared to equip an anti-amaryl aerodrome.

*Dr. MacLennan* asked if penalties would be left entirely to local regulations or would a general working idea be given?

Yes. It can be £100 or 4d.

*Dr. Ornstein:* (i) Article 38 (2): Reference the word 'growth'—French 'development'. Does this include anti-imago measures or only anti-larval?

(i) French is clear; but "growth" is not a happy translation. All aerodromes are being run by local authorities.

(ii) Article 36. If country has passed a law against introduction of virus what is the procedure?

(ii) Bloods can be sent away, but we should not bank on that too long.

(iii) What is refuelling? What does he do?

(iii) No definition. Sir Geo. Buchanan thinks it is explained in the Aerial Navigation Convention.

*Dr. Johnson* regarding Article 42 with Article 47 and the expressions in Article 42 "who it has been duly established" and in Article 47 "six days since possible exposure" thought it required further definition.

This point has already been raised. If a man is found infected in an anti-amaryl aerodrome he is kept back.

*Question.*

*Dr. Scott:* (i) Article 5, interpretation of "spirit" rather than "letter"? No traffic yet to Tanganyika from West Coast; but Tabora will be the site of sanitary aerodrome for this. Seven other aerodromes and 23 emergency landing grounds are now in action. Though none are strictly according to the Convention, all are provided as in *spirit* of Convention.

(ii) Article 25. "Forced landings." These provisions are not enforced at Tanganyika. Wireless on forced landing and telegraphic information of all air craft leaving infected area are needed.

*Dr. Gills:* Can we advise our Governments to accept this Convention in this spirit?

*Answer.*

(i) Latitude of interpretation conceded (I I N. B.) regarding ambulances, housing, etc.

This is for the administration concerned to consider how far the spirit and letter are met.

(ii) This is same as in International Air Navigation Convention.

Yes.

## APPENDIX 12.

*Report of Discussion on Dr. Duff's memorandum (item 5, Appendix).**Question.**Answer (by Dr. Duff).*

*Sir G. Buchanan:* (i) Is there any evidence from the Gold Coast of recent extensions along new routes being opened up?

(i) Tinnali on the hinterland had its first yellow fever in 1931 but Duff thinks infection was there and not imported. It might, however, be considered as evidence of 'up' spread.

(ii) Has any one returning from West Africa (Gold Coast) developed yellow fever on the ship (i.e., within six days of embarkation)?

(ii) It is possible for a European to have been bitten ashore within the six-day period and to have brought infection on board, but no such case is known to him.

(iii) Is there any regular air route through the Gold Coast?

(iii) At present no air services and no trunk routes exist. This question of aeroplanes was quite new to them.

*Sir E. Thornton:* Has there been any extension of yellow fever since opening and extension of the railways?

At Oda on Central Provincial Railway one European case occurred source unknown.



No screened houses, but only nets are in use.

*Dr. Park Ross:* Information asked for regarding screening of houses in Gold Coast segregation areas.

*Dr. Scott:* information asked regarding stand pipes and water connections to houses in the large native areas.

Stand pipes are limited in native quarters; but criterion usually is ability to pay for the connection.

*Genl. Graham:* (i) Would he be prepared to site an anti-malarial aerodrome in his cantonment or reservation area at Accra?

(i) Yes.

(ii) How far is this area from the native town?

(ii) See III.

(iii) What is the site of election of an aerodrome in or near a residential area in your country?

(iii) Preferably near one of the residential areas, otherwise one mile outside town in the direction where town extension is not likely to go and which can be controlled—minimum distance  $\frac{1}{2}$  of a mile.

*Dr. Johnston* mentioned certain points which should be emphasised and was then asked questions. He stressed the following:—

(i) *Water supply:* This was the most effective measure of all in malarial control and Governments should encourage it by loans. Nigeria has big

schemes as also have the native administrations there. These schemes should not be for European reservations only.

(ii) *War against stegomyia* important; but *Taeniorhynchus* as a possible carrier should not be forgotten.

(iii) *Education*: Hygiene education should be given in all schools and Europeans need it most in view of the obstruction to inspectors and of the abundance of house mosquitoes, especially from vases and even ice-chests, etc.

(iv) *Adult mosquito population* should be estimated approximately i.e., seasonal index for adults and larvae should be determined. A + + index can often be revealed if sanitary inspectors are given torches.

(v) *Value of Post Mortems*: If no Post Mortems then cases are missed. It is easy to make a liver examination on every case by the Rockefeller "Viscerotome" without a formal post mortem and by this we see midzonal necrosis of yellow fever (e.g., Brazil).

(vi) *Ship cases*: In 21 years experience he has not known of a case in a ship's officer which has developed on board; though, in coastal sailings, cases have occurred, no doubt due to night work. As many young district officers do not live in satisfactory segregation areas therefore all should pass six days in one of the European areas before sailing. At Lagos boats lie along in the lagoon.

(vii) *European segregation*: Create a 440-yard building free zone and compromise over servants in compounds by having boys only if possible. This is the important thing to stress. Dr. Sawyer reinforced all the above points. He thought adult indices were a good check on larval suppression, e.g., Brazil and here they formed the best men into squads which were called "Mother Foci Squads" to attack the "fons et origo".

Dr. Duff cited the cases of himself, a Mr. Oakley and wife who had been on the Coast 20, 21 and 20 years respectively with no knowledge of having had a disease like yellow fever, yet Mr. Oakley was a +

Sir E. Thornton asked regarding malaria as a result of bush clearing and was informed that after such clearing "dubb" grass was planted in European and native areas with low growing crops in the latter also (e.g., ground nuts and beans).

Dr. Scott asked regarding the nationality of sanitary inspectors. These are African uniformed sanitary inspectors who bear a polite note from Medical Officer of Health; but must first see the European occupant before anything is done.

Dr. Smith thought Indians would be a useful index of the presence of the disease. Zanzibar has now a stegomyia house index of 1 worked out from annual statistics; weekly inspections, a piped water supply and is reasonably safe from stegomyia.

Dr. MacLennan, who depends on shallow wells, asked for additional ways of killing stegomyia in them other than by oil and was told the method of making them mosquito proof.

Dr. Gilks asked for details of "adult" control and was told that adults were not dealt with except when there was a case of yellow fever when there was fumigation by SO<sub>2</sub> or HCN.

Dr. Orenstein asked: (i) if there were any cases of officers arriving from native potentially infected areas at non-infected ports within the incubation period and developing the disease within six days of arrival. He said yellow fever cases were from time to time brought to Panama but since 1906 not a single case has occurred there.

Dr. Johnson described one case—a missionary from the borders of Lake Chad—who did two days by motor road (400 miles) to rail head and two days on by rail at Jos to Lagos, was ill on arrival at Jos but boarded the train and died one day after arrival yellow fever being confirmed. Such a case

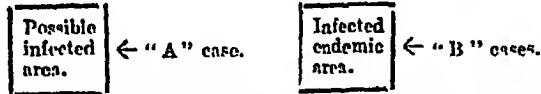
might have boarded an aeroplane. There were two others with him but neither was affected.

(ii) *Taeniorhynchus* was negligible, e.g., no case in Panama since 1906 though *Taeniorhynchus* present. Dr. Johnson said this was reassuring.

(iii) *Detection of larvae*: Electric torches essential as, when one bends and throws a shadow, the stegomyia fall to the bottom especially in shallow wells and torch or acetylene lamps show them up. Dr. Johnson agrees.

(iv) *Breeding grounds of stegomyia*: If adults present then breeding grounds must be near, e.g., case of the drip from an ice-chest on battleship at Panama: also bamboo nodes. Dr. Johnson agrees.

(v)



"A" case (1 case) not necessarily from "B" (though many cases here). Possibly "A" due to introduction of non-immunes in numbers without special stegomyia introduction.

*Sir George Buchanan asked*: (a) if air routes in Nigeria were regularised and Dr. Johnson said that there were at present no definite air routes but only occasional fliers and official visits from R. A. F. in Soudan.

(b) What are arrangements for air craft from other countries? These are examined by the Port Health Officer, Lagos, in the same way as shipping is, and in the North by Medical Officers of Health. There are no official landing grounds.

## APPENDIX 20.

## PLAGUE.

*Report on the position in regard to, and measures employed to combat, plague in the Union of South Africa, the Mandated Territory of South-West Africa, Angola, the East African Colonies and Protectorates, Bechuanaland and other African countries represented at the Conference.*

The subject of plague was considered in the Plenary Sessions of the Conference, held on November 18th and 21st. Papers were read by Sir Edward Thornton, Dr. Hindsbeeck, and Dr. Damas Mora. Delegates from African countries which are, or have been, infected with the disease contributed to the discussion, whilst Major-General Graham gave a résumé of the experience of India with special reference to anti-plague vaccination and serum treatment; Sir George Buchanan drew attention to the relevant articles of the International Sanitary Convention of 1926, dealing with international co-operation.

*I.—Introduction and Spread of Plague.*

In Southern Africa human plague appeared first in 1899 and most outbreaks were traced to known infected ships or centres. Since then plague has occurred in many areas and its spread has been associated definitely with epizootics amongst wild rodents. Up-to-date the deaths recorded as due to plague in the Union of South Africa total 1,783.

It appears that in East Africa plague must have been endemic for many years prior to European occupation. The countries most affected have been Uganda, Kenya, and Tanganyika Territory. As a striking example of the heavy incidence of plague in East Africa, it may be mentioned that in Uganda 56,000 deaths from plague have been known to have occurred during the period 1930-31. In the case of Tanganyika it is thought that field rodents can have had little influence on the dissemination of plague in late years, but as in the case of the other infected regions, it is maintained essentially by domestic rodents and the flies infected by them.

From West Africa an outbreak of plague, lasting from 1921-1931, has been reported from Nigeria, in Lagos and nearby towns. There has been no reason to suppose that infection has spread into the interior of the country. The delegate from the Gold Coast gave information of plague outbreaks in 1908, 1917 and 1924, since when there has been no further plague infection in that colony. In Angola a few cases of human plague occurred at the sea ports up to 1929. The disease has recently appeared in the Mandated Territory of South-West Africa and in Southern Angola in wild rodents and in man. This spread has been traced from the Union of South Africa through the Kalahari, part of which lies in Bechuanaland Protectorate, into Oranienburg (South-West Africa) and onwards into Angola. The spread of this infection is attributed to the same causes as operate further south and the same wild rodents have been proved to have carried the disease.

*II.—Present Position.*

Taking the information contributed to the Conference seriatim:—

A. *South Africa*.—Rodent plague infection must be considered to be prevalent throughout the greater part of South Africa where it is accompanied by occasional small outbreaks or sporadic cases of human plague. But the urban areas, with a few exceptions, and all the ports have remained free from rodent infection, or human plague, during the last seventeen years. Infection has now overrun the Union borders and has invaded the Mandated



Territory of South-West Africa and also Angola; the position in these two countries is now similar, in every respect, to that obtaining in the Union except that in Angola infection has been confined, as far as can be ascertained, to the southern portion of the country, whilst in South-West Africa the spread has been more general. As in neighbouring plague infected countries the spread of plague has proved to be dependent, almost entirely, on the infection existing amongst wild rodents; the connecting link between the wild rodents, chiefly gerbilles (*Tatera lobengulae*), and man is the multimammate mouse (*Mus. coucha*) which in the Cape area is replaced by the striped mouse (*Rhabdomys pumilio*). Therefore in the Union, outside the urban areas, ports and railways, in which domestic rodents are being "built out", and other measures against rodents are taken, attention is concentrated on the measures for the extermination of rodents with the object of preventing infection from wild rodents to the domestic species and so to man.

B. *East Africa*.—With the exception of Zanzibar and Mozambique, plague is now endemic in many areas of the East African countries represented at the Conference, particularly in the Eastern portions of Uganda, but the ports on the East Coast have in recent years been free from infection. So far it is the domestic rodent which plays the most important part in the spread of human plague in East Africa, but rodent surveys have not been completed in any East African country and certainly some infection has been recorded amongst wild rodents.

C. *Other Countries Represented*.—Except for one outbreak in the Loanga valley during 1917 no cases of rodent or human plague were reported from Northern Rhodesia. There is no history of infection in man or rodents having existed in Southern Rhodesia, or in man in Basutoland. In Bechuanaland Protectorate no human cases have occurred, but rodent infection has taken place over a wide area. Neither rodent nor human plague is known to exist in Nigeria or the Gold Coast at the present time.

### III.—Possibilities of Extension of Plague.

Infection is widespread in the Union of South Africa and plague, both human and rodent, has been demonstrated on its borders, particularly in the southern portions of Bechuanaland Protectorate which were found to be heavily infected with rodent plague in 1928. Therefore it seems probable that it is a question only of time before other countries become infected in the same way as South-West Africa and Angola. The climatic and other conditions which prevail in the countries bordering on the Union resemble those in the Union and there does not appear to be any demonstrable factor which can be expected to prevent the slow spread of plague North and East. The delegates from Portuguese East Africa, Northern Rhodesia, Southern Rhodesia considered that the invasion of the territories they represent must be regarded as possible, if not probable in the near future.

In Kenya, Tanganyika and Uganda, as indicated above, the position does not appear to be governed by the wild rodents, and in both Uganda and in Kenya it has been possible to show that the spread of plague is coincident with the advance of the black rat (*Rattus rattus*).

On the other hand the dissemination of plague outside Africa from South African and East African ports was considered to be unlikely so long as the present precautions are enforced and the ports kept free from infection. In the Union of South Africa every precaution is taken to avoid conveyance of plague infection through maize exposed to infection at its source. Maize loaded on ships via the elevator system is freed from fleas and does not convey plague infection. Bagged maize is more dangerous but when necessary it is stacked in the open and treated with hydrocyanic acid gas. Attention is also paid to the importance of not sending away ships carrying cargoes of maize or other foodstuffs whilst they contain any appreciable number of rats; this is of importance from the point of view of commerce as well as that concerned with the risk of plague transmission.

In East Africa attention needs to be given to certain staple exports, including cotton and cotton-seed and coffee, which at the place of their collection or storage may be attractive to rats—and so come to harbour plague-infected rats and fleas.

While the possibility of infection of this kind of merchandise is to be admitted, it is noteworthy that the endeavours which have been made to detect the presence of rats or fleas in trucks or bales which arrive at the coast have yielded little or no evidence that the danger of exportation of plague in his way is a substantial one.

Investigation on arrival at Mombasa of closed steel trucks laden with cotton seed from Uganda has shown only a very low infestation with live fleas.

#### IV.—Conclusions.

(1) In South Africa the dissemination of plague depends principally on infection of wild rodents, in other parts of Africa the domestic rodents play the determining role.

In South Africa there is little danger of urban outbreaks of plague inasmuch as towns are protected by the "building-out" of rodents, anti-rat measures, and in some instance by rodent-free belts. The problem is chiefly rural, and attacks on veld rodents by means of trapping, gassing and poisoning are the principal anti-plague measure.

In East African countries local conditions are often unfavourable to an efficient anti-wild rodent campaign, even if such were necessary. Where the multimammate mice and other similar rodents play an important part, as seems the case in certain areas, an anti-wild rodent campaign would have to be undertaken; generally speaking however in East African countries anti-plague measures can be directed principally against domestic rodents.

It should be noted that in East Africa it would appear that the presence of *Rattus* *Rattus* militates against the invasion of buildings by multimammate mice and similar rodent species which were formerly domestic rodents in these countries.

(2) A primary requirement, from the international point of view, is the sending, at suitable intervals, of information to the Office International d'Hygiène Publique regarding new evidence obtained about the extension of rodent plague and the measures taken to deal with it; in this way a record is available to the health administrations of all countries interested. Besides this examples have been brought to the notice of the Conference of co-operation having taken place between countries infected with plague and others which have been threatened with the possibility of outbreaks. There can be no doubt that great benefit has resulted from this co-operation which has taken various forms, in one instance a conference was arranged to decide upon mutual action by the representatives of the Health Department of the Union and officers from South-West Africa and Angola; in a second instance a rodent survey of a portion of Bechuanaland Protectorate was carried out by the Union Health Department acting at the request of the Bechuanaland Government. The great importance of co-operation was realised and it was thought that even more could be effected in the future by local agreement between neighbouring countries and by following up notifications of epizootics or of first cases of plague by communications outlining the course of epizootic or epidemic from time to time. Some anxiety was expressed as to whether an epidemic in South-West Africa was under proper control and it was thought that if a rainy season occurred it might be necessary for the Administration responsible materially to strengthen the staff to enable the outbreak to be effectively handled.

(3) Much has yet to be learned regarding the protective efficacy of anti-plague vaccination in different circumstances, and the degree of importance which should be assigned to this method of protection among those available for preventing the extension of human plague. The Conference noted that special inquiries on this subject are now in progress at the Office International

d'Hygiene Publique, in which it is evidently desirable that African health administrations should fully participate. At the moment it was only possible to note the principal facts contributed by the Delegates present in regard to the employment of vaccination in their territories.

In British India, as is well known, anti-plague vaccination (Haffkiné) is practised on a large scale as one of the routine precautionary measures, and is reported, on the basis of large experience, to be attended with considerable success. A vaccine prepared locally according to the Haffkiné method is employed in South and East Africa. Vaccination of the mass of the population against plague is not now attempted either in Kenya or Uganda. Vaccination, however, is used on a considerable scale for contracts in infected areas in Kenya, and to a less extent in Uganda and Tanganyika.

In Angola, the vaccine employed is obtained from the Pasteur Institute in Paris, and utilised on a large scale for prophylactic work, when plague occurs. Little use is made of anti-plague vaccination in the Union of South Africa.

In general, vaccine is made available to and employed for the close contacts of infection, *e.g.*, those engaged in anti-plague work.

(4) Disinfestation and disinfection of shipping was discussed and the attention of the Conference was drawn to the standards agreed upon by the Fumigation Commission of the Health Committee of the League of Nations in respect of H.C.N. gas and Sulphur Dioxide.

(5) During its session the Conference had the advantage of witnessing a demonstration of the gassing of wild rodents by the use of cyanogas dust—a method which has been very efficiently developed in the Union of South Africa. In the practical application of this and similar methods of plague control, as well as in all aspects of plague research, it is important that African administrations should take as active a part as circumstances and opportunities permit, in order to add to our technical and scientific knowledge.

(6) The economic aspect of rat destruction as distinct from disease dissemination must not be lost sight of in view of the extensive damage to property and foodstuffs, for which these rodents are responsible.

## APPENDIX 21.

*Leprosy in the Union.*

The general policy regarding leprosy which the Department has been steadily pursuing for years past is in agreement with the principles set out in the Report of the Bangkok Conference.

It comprises compulsory segregation of infectious cases so long only as they are considered infectious and a danger to health, but the law is administered liberally and sympathetically and always from the standpoint of the public health and social interests of the community.

*Institutions.*—There are at present five institutions in the Union where lepers are segregated. All except that at Pretoria admit Natives only. At Pretoria Europeans, Natives, Asiatics and persons of mixed race are segregated.

The following figures regarding certified cases of leprosy in the Union during the year ending 1st July 1931 may be of interest:—

Total lepers in Institutions . . . . .	2,281
Home Segregated . . . . .	11
Discharged lepers under Surveillance . . . . .	1,239
Released from Surveillance . . . . .	511

*Control of Contacts.*—When a case is notified and removed to an institution all his or her immediate contacts, i.e., persons living in the same dwelling or kraal, are examined by a Government medical officer, a nasal smear for bacteriological examination being taken at the same time. The full name and address of each such contact is recorded in a register kept by the magistrate of the district. Each contact is again medically examined and a smear taken a year later, and again five years later.

*Treatment of Cases.*

*A. General Treatment.*—The treatment both general and special carried out at the various institutions varies a good deal in extent and also somewhat in nature, but it may justly be stated that at the two main institutions—at Pretoria and Benjanyana—there are very few patients indeed who are not undergoing both general and special treatment.

The treatment given aims at improving the patients' general condition of health, physical fitness and resistance coupled with suitable and liberal dietetic treatment and hygienic measures.

Associated diseases of which syphilis is the most common are in all instances suitably treated.

In regard to physical exercise, all Institutions have extensive grounds which the patients are permitted to use. Much of the manual work of the Institutions is done by the patients for payment—an arrangement which assists many patients in the financial support of their healthy families outside. This arrangement also tends to make patients more independent and contented.

*B. Special Treatment.*—This mainly consists of giving Chaulmoogra oil or its derivatives. The oil from *Hydrocarpus Wightiana* is purchased from Indian firms specially recommended to the Government. Patients receive every encouragement to undergo treatment on modern lines, and all institutional medical officers are supplied with various Chaulmoogra oil preparations with or without creosote or iodine. Alepol has also been extensively used.

Ethyl esters, plain or iodised, are also available, and as the Government chemists are now manufacturing a very pure ethyl ester it is anticipated

that an increased amount of South African made ethyl esters will be used in the future.

Special soaps are not made much use of, but Native patients are often fond of using *Chaulmoogra* oil in the form of immersion.

*C. Treatment of Leprosy Reaction.*—This is usually treated by suspension of special treatment, rest in bed, milk diet, attention to bowels, etc.

*D. Additional Treatments.*—Other forms of treatment are also carried out from time to time. These include protein shock, antimony, iodine, etc. Painting with trichlor, acetic acid or collodion sulicylic acid is also carried out. The use of trichlor, acetic acid though much in favour with certain patients has, however, often to be restricted not only because it may mask the true condition of lesions but also because of its tendency to cause a keloid condition.

Heliotherapy has apparently not much effect upon the disease but sun-baths and hydropathy appear to materially improve the general health of patients. In the latter connection the patients' daily bath is held in high repute as an adjunct to treatment.

Suitable surgical treatment especially where bone is affected is as essential as a resident institutional bootmaker able to design suitable fitting boots for patients with lesions of the feet.

#### *Discharge of Cases by Leprosy Board.*

The Union Government has for years past caused all lepers in its institutions to be periodically examined and classified by an authoritative leprosy board of medical men with a special knowledge of leprosy.

The Board classifies each case by a uniform method and discharges on probation under surveillance all cases in which the disease is no longer infective or is considered to be arrested.

Under the Board's Terms of Reference cases are classified as maculo-anæsthetic, nodular and mixed, but these classes are divided into special sub-types in such a way that the main factor taken into account is not the severity of the disease as is recommended by the Manila Conference but the question of activity and infectivity of the disease.

By classification in this manner we are at a glance able to estimate approximately the probability of discharge or arrest of a large number of cases in each institution.

The patients themselves, particularly Native patients, take very considerable interest in their annual classification and in point of fact a patient's classification very frequently has a very important bearing on his keenness for undergoing treatment.

The Board's visit is looked forward to with excitement by a large number of patients and the number of discharges has an important bearing on the number of patients being voluntarily admitted to our institutions.

In passing it is well to record that as a result of propaganda in the Native areas and increasing belief in the value of treatment and the large number of non-infective or arrested cases being discharged each year from our institutions the number of voluntary admissions to our institutions is increasing each year.

#### *Discharge of Cases.*

Discharged cases are carefully followed up. When a patient is discharged from an institution his future address is registered in the office of the magistrate of the area where he resides. If the patient is without means of support the Government assists him by means of a monthly monetary allowance. The patient is bound to notify the magistrate of any change in address. He is examined clinically and bacteriologically every six months for the first three years after discharge and once a year for the second three years. If at any time he becomes again infective during this six-year period

he is re-admitted to a leper institution. If there is no recrudescence during the six-year period the patient is finally discharged from surveillance.

Even in the Native Territories we are able to keep in touch with the majority of discharged cases in this manner.

*Patients probationally discharged from Institutions and number of such patients who have been re-admitted to Institutions as recrudescant.*

			No. of Probationally Discharged Patients who have been re- admitted to Institutions as recrudescant.	Total number of Patients in Institutions.
Year ended 30th June, 1923	.	.	503	2,501
" " " 1924	.	.	254	2,141
" " " 1925	.	.	105	2,174
" " " 1926	.	.	70	2,271
" " " 1927	.	.	171	2,322
" " " 1928	.	.	225	2,405
" " " 1929	.	.	253	2,302
" " " 1930	.	.	321	2,279
" " " 1931	.	.	335	2,284
TOTAL			2,237	20,679

## APPENDIX 22.

*Report of the Committee on the control of Leprosy in Africa—with special reference to the Bangkok and Manila Conferences.*

The Committee on the above was constituted at the first Plenary Session of the Conference as follows:—

General J. D. Graham.  
 Dr. S. W. T. Lee.  
 Dr. N. M. MacLennan.  
 Dr. R. M. Morris.  
 Dr. H. R. F. Nattle.  
 Dr. W. B. Johnson.  
 Dr. F. C. Willmot.

General J. D. Graham was elected Chairman and Dr. Willmot, Rapporteur. Dr. de Sousa and Dr. Hinsbeeck, Members of the Conference, also attended and briefly addressed the Committee.

*General.*—At the request of the Chairman, each member briefly outlined the leprosy problem in the Region which he represented.

From the ensuing discussion, it was clear that the leprosy policy problem and practice in the various Regions of Africa varied within very wide limits.

*Bangkok Report.*—After discussion, the summary and conclusions contained in this report were found to be acceptable to all members.

*Isolation of Cases.*—Members, while accepting the view that isolation of infectious cases is one of the necessary measures in prophylaxis of the disease, are of opinion that a comprehensive system of effective isolation of all infectious cases is, in certain of the large Regions of Africa, not at present a practicable proposition.

Members desire to emphasise that any system of compulsory isolation of cases of leprosy must be imposed with discretion, bearing in mind not only the public health and social interests of the community at large, but also the effect of such measures on the native mind and the danger of undue rigidity causing natives to hide cases which may be highly infectious.

Any form of propaganda, especially amongst natives, and any measures which will encourage natives to report early cases of leprosy, should be encouraged to the utmost.

Apart altogether from the question of discharge from leper institutions of arrested cases of the disease, members are in agreement that the cases or types of leprosy which may be regarded as "closed" and which, while still showing clinical evidence of active leprosy are nevertheless free from bacilli, should not be compulsorily detained in any leper institution.

*Manila Report.*—Members are in agreement generally with the views expressed in conclusions of the report. All are agreed as to the desirability for uniformity of methods and terms in such matters as the designation of cases, lesions and nomenclature.

With regard to the classification suggested in the report, members were informed that there are certain sub-types of leprosy in South Africa which do not fit in with the proposed classification. The matter is, therefore, still under consideration by the Union Government. The other members are prepared to accept the classification referred to.

*Medical Treatment of Leprosy.*—In practically all areas some form of chaulmoogra oil treatment is in use. Iodised Ethyl Esters are being tried out in several of the areas, and in two of them, namely, in the Union and Nigeria, this preparation is being successfully manufactured in the manner prescribed in the Manila report.

*Evaluation of Terms.*—While the majority of members are in agreement with the definitions of "active cases", "quiescent cases", and "arrested cases", the South African delegate holds the view that the definition of an "arrested case" should receive further consideration in the light of South African experience, which goes to show that in many cases the period can be reduced to one year, provided the bacteriological examination over the yearly period is carried out monthly.

All members are agreed as to the necessity of abstaining from making use of the word "cure" as applied to leprosy.

*Conclusion.*—At the outset it was stated that anti-leprotic activities and measures in operation in different African States varied considerably. The reasons for this are to be found in the fact that apart from the incidence of disease and other factors, the public health problems and the magnitude of such problems, particularly in Africa, vary very widely, and Health Administrations dealing with such matters as Yellow Fever, Plague, Malaria, Yaws, Syphilis, Sleeping Sickness and Tuberculosis, can only assign such energies and expenditure to leprosy as the disease warrants, in view of its relative importance to other problems with which they are faced.

The recommendations contained in these reports can, therefore, only be applied to any of the African States to an extent which the public health, local needs, conditions, machinery and financial resources pertaining to the country concerned justify.

F. C. WILLMOT,  
*Rapporteur.*

Cape Town, 24th November 1932.



## APPENDIX 23.

## SMALL-POX COMMITTEE.

*Memorandum for discussion.*

1. *Terms of reference.*—To consider the adoption of uniform regulations for the prevention of the introduction into Southern and Eastern Africa of Small-pox from India.

The Committee consists of:—

Dr. Gilks (Chairman).  
 Dr. Smith (Zanzibar).  
 Dr. De Souza (Portuguese East Africa).  
 General Graham (India).  
 Dr. Park Ross (Union of South Africa).  
 Dr. Scott (Rapporteur).

2. Experience at African ports has shown that cases of small-pox frequently arose on ships between Boatbay and the port of destination. Twelve such ships reached Durban during 1929-30.

This caused expense to shipping and grave inconvenience to the travelling public.

The East African territories run a very grave risk from the introduction of small-pox cases in the incubation stage by passengers who have already disembarked after transit in a healthy ship. A serious epidemic of virulent small-pox occurred in Tanganyika following the disembarkation of a passenger in the incubation stage of the disease evidently infected before departure from India. This outbreak bore striking contrast to the mild small-pox which occurs still in the South Western area of the Territory, between which there was no connection. In the virulent outbreak the case of mortality was 20 per cent. It was therefore necessary for the countries concerned to take measures to protect themselves and the shipping from this recurrent dislocation of traffic and inconvenience to passengers.

To secure this end the "importing" Governments laid down in 1930 the conditions under which they would accept passengers from India as being sufficiently protected from small-pox. This they were entitled to do under Article 15 of the 1926 Convention: but the conditions were not the same in each country, and much correspondence ensued between the British Government and the other Governments concerned, ending with the decision to discuss the question at this Conference.

3. The 1926 Convention was framed to reduce inconvenience to shipping and the travelling public: while it is recognised that quarantine is an antique procedure to be avoided as far as possible. Article 57 empowers Governments to conclude special agreements to make the Convention's provisions more efficacious and less burdensome; and the proposal of the Government of India for the adoption of uniform regulations and procedure is in accordance with the specific intention of Article 21, which recommends that countries should agree between themselves upon the preventive measure to which emigrants shall be submitted in the country of departure, so as to ensure that medical rejections on arrival may be reduced to the fewest possible.

4. Such measures if effective protect both shipping interests and infectible countries, and the action taken in 1930 did in fact accomplish its intention, since no small-pox has occurred on a ship bound for Durban since leaving its last Indian port from 2nd April 1930 onwards. It is for this Conference to agree upon minimum uniform practical measures prior to departure which will furnish security for the public health.

5. The principles governing the prevention of small-pox are generally agreed: It may be as well to restate them for the sake of clarity:—

- (1) Successful vaccination with active anti-rariolous lymph including such reactions or absences of reaction as disclose immunity, effected not less than twelve days and not more than three years previously.
- (2) A previous attack of small-pox (of which typical scars may be accepted as evidence).

6. Difficulty has however occurred regarding the method of applying these principles in practice: and experience has shown the difficulties which occur in establishing evidence of successful vaccination in a given individual. It has been suggested that the following evidence would prove acceptable to the "importing" Governments, always bearing in mind, that the responsibility for the decision as to the protection enjoyed by any individual rests with the port Health Officer at the port of disembarkation, and that the evidence of protection and identity submitted must be acceptable to him and does not of itself confer the right to admission.

- (1) A reliable certificate of successful vaccination, written in the English and French languages.

NOTE.—It has been represented that the certificate in order to be regarded as reliable, should be issued by a registered medical practitioner and endorsed to that effect by the Health Authority at the port of departure who should satisfy himself as to the identity of the individual. Successful vaccination includes such reactions or absences of reaction as disclose immunity, and full details must be given in such cases.

- (2) Evidence of previous small-pox as indicated by scars.

The Port Health Officer should be authorised to exercise his discretion in the case of infants born during the voyage, and in the case of alleged loss of certificate where the alleged vaccination is supported by scar evidence. It has also been suggested that Government servants who have not complied with the regulations and being readily subject to control might also be subject to the discretion of the Health Officer. Although I supported this proposal in the first instance I am doubtful whether we can properly discriminate in a matter of this sort between different classes of offenders.

7. The suggestion emanating from Dr. F. V. Adams, the Port Health Officer of Dar-es-Salaam, and supported by the Government of Tanganyika and Uganda, that the Passport system would form a convenient method of health certification, commencing with the insertion on passports of particulars relating to anti-small-pox vaccination, is also submitted for the consideration of the Committee, which may see fit to advise the Conference to recommend further examination of the proposal. It is suggested that the insertion of particulars relating to anti-small-pox vaccination might from the first step in this connection.

The International adoption of the proposal would, the originator suggests:—

- A. Operate to limit the spread of small-pox over frontiers.
- B. Remove or diminish the necessity for quarantine restrictions which cause heavy losses to the travelling and mercantile communities.
- C. Be a boon to travellers who might thereby expect to escape delay and/or vaccination in the course of a journey: and reduce the number of papers carried.
- D. Profit the Governments concerned, indirectly by avoiding interference with trade; and directly by the receipt of fees, the extension of vaccination, and the decrease of preventive work at ports of arrival.
- E. Be capable of eventual extension to include other diseases such as Tuberculosis and Syphilis, for which certificates of freedom are at present required by neighbouring administration.

## APPENDIX 25.

*Memorandum from Dr. Park Ross of Union Health Department,  
Durban.*

## PRECAUTIONS AGAINST SMALL-POX AT PORT OF DURBAN.

The practice at the Port of Durban in respect of ships arriving from India who have landed Small-pox cases at Intermediate Ports during the voyage, is to quarantine deck passengers for a period of 16 days after the last cases of small-pox had left the ship, and to permit 1st and 2nd class European passengers to proceed to their homes in the Union, provided they give a satisfactory address, and satisfy the Port Authorities that they will be within call for a similar period.

The difficulties arising in connection with the control of Indians who might claim to be similarly treated is reflected in a Minute from the Secretary for Public Health to the Port Health Officer, Durban, No. 403/6 of 26th April 1924, which represents the position to-day, and outlines the policy at present followed:—

"You are no doubt well aware that the Indian community is very sensitive to anything which in their view savours of racial distinction, and it is very desirable that in instituting health precautions every care should be taken to minimise delay or inconvenience to any member of the community and where action is taken to make clear that it is taken for the purpose of safeguarding the public health and is entirely dependent on circumstances other than the race of the persons concerned.

The Minister is desirous, especially under present circumstances, that any ground of complaint should be avoided where possible. I have informed him that respectable Indians domiciled in Natal, or who can otherwise be identified or traced are dealt with on precisely the same lines as members of other races, but that as a rule Indian deck passengers on landing simply disappear and cannot be traced; that they often change their names on landing and addresses daily for some time thereafter; that they give false addresses or addresses that do not exist or they give false references and their statements as regards destination, etc., are often utterly unreliable. I have further pointed out to him that if an Indian small-pox contact landed from a vessel subsequently developed the disease without being under effective surveillance by the local authority, and, if as a result of delay in discovery, an outbreak occurred, the local authority concerned would have grave cause for complaint against this Department and that therefore the only safe course is to detain either on board the vessel or on Salisbury Island persons of a type, who, if allowed to land, cannot be kept under effective surveillance. It is unfortunate that such persons are as a rule Indians, but this is incidental, so to speak. The Department, however, relies on you to minimise the restrictions and to carefully avoid any legitimate grounds for complaint."

That the risk at Durban is a real one might be illustrated by the following:—

During the first half of 1926, and for some years previously, there had been no Small-pox in Natal.

Vaccination, which used to be practically 100 per cent., was being less drastically enforced, and there was a certain number of insufficiently protected persons.

The "Karapara" landed a case of Small-pox at Zanzibar, during her voyage from Bombay to Durban. On arrival here on 17th June 1926, two suspects among the crew were removed to the Isolation Hospital on Salisbury Island, where the deck passengers were already in quarantine.

A third suspect was removed on 20th June 1926.

On the 3rd July 1926, our Head Hospital Attendant developed severe Small-pox, losing an eye.

It appeared that he had not vaccinated himself with the lymph given him by the Port Health Officer, although he was held to have been previously efficiently protected.

On 13th July 1926, a Durban Tramway Inspector was discovered in an advanced stage of Small-pox, from which he died.

The Municipal Authorities, as soon as the case was discovered, took appropriate action. His Kitchen-bey, however, reported sick to his Mistress, bolted on the Master being taken to hospital, and has never been traced.

The Inspector admitted on his death-bed that he had made clandestine visits to the "Karapara" while she was in quarantine, and no other source of his infection can be suggested.

In October 1926, the Municipal Authority found 4 cases suspicious disease in an Indian Barracks in Durban, and we confirmed their diagnosis of Small-pox.

Investigation showed that other people in the same barracks had been ill during the previous 2 months of a similar disease, and had cleared out lest they should be caught. Further cases occurred in these barracks, and in immediate search in Durban and its crowded environs disclosed during the next 6 weeks some 67 cases of Small-pox, many of them very severe indeed.

The epidemic was stopped by mass vaccination, practically the whole population in Durban and round about, some 227,000 in all, being vaccinated within a couple of weeks. The disease was immediately checked.

The local vaccination position is no longer satisfactory, owing to evasion of the vaccination law, and deliberate hostility thereto by a section of the Native people, although the mass is strongly in favour of vaccination, when they feel there is a need for it.

No case of actual Small-pox has been landed since then.

A list (marked A) of ships arriving during 1929 and 1930, at Durban from India, which have landed cases of Small-pox up the Coast is appended.

It will be noted that there were 12 such ships.

During 1931, no ships bound for Durban landed cases in Africa, though the "Umzumbi", bound Calcutta to Durban, landed 2 cases at Colombo among members of a new crew she picked up at Calcutta, and who were stated by the Captain to have been vaccinated 5 days before departure from Calcutta.

As a result of these occurrences during 1929 and 1930, and our prior unhappy experience, I wrote the company concerned, and asked if it would be possible to have all passengers vaccinated 30 days before arrival here.

The Durban Agents communicated with Bombay, asking them to give effect to this. The Indian agents pointed out that they were powerless to insist. Accordingly the following correspondence ensued:—

*"Extract from Minute No. 64, 25/1 of the 12th February 1932, from the Secretary of Public Health, addressed to the Secretary for External Affairs, Mack's Buildings, Cape Town.*

With a view to preventing, as far as possible, the introduction of small-pox into the Union, it is considered advisable that the attention of the Indian Government be drawn to the matter with a request that all Indian passengers coming from small-pox infected areas be required to carry certificate of successful vaccination performed at least three weeks prior to date of arrival."

*"Government Notice No. 92, dated 20th May 1930.—The Minister of Public Health has been pleased, under section one hundred and six of the Public Health Act, No. 34 of 1919, to make on the following regulation to be in force throughout the Union, with effect from the date hereof:—*

No person who has within the thirty days preceding been in any part of India shall be permitted to enter the Union unless he produces evidence to the satisfaction of the Port Health Officer or other Officer duly authorised thereto by the Minister that he—

- (a) has been successfully vaccinated against small-pox within the thirty days preceding; or
- (b) is unacceptable to vaccination or re-vaccination owing to previous vaccination or otherwise; or
- (c) has previously suffered from small-pox.

*"Extract from a letter dated 24th July 1930, from the Viceroy and Governor General of India, addressed to the Governor General of the Union of South Africa.*

I am concerned to read of the several cases reported by you in which vessels arriving at Durban since September 1929, were found to have cases of small-pox on board, and am making enquiries in the matter. My Government are also further investigating the question whether any steps can be taken to prevent unvaccinated persons from embarking on ships sailing from India to South Africa. I shall inform you in due course of the conclusions at which they arrive."

*"Extract from Minute No. 102 C of the 31st January, from the Secretary for Public Health, addressed to the Assistant Health Officer for the Union, Durban, being the 1st communication received in connection with the proposed adoption of a uniform set of regulations to prevent the spread of small-pox.*

I am advised by the Secretary for External Affairs that a communication has been received from the Viceroy and Governor General of India to the effect that the proposals are still receiving the attention of the Indian Government, and a reply on the subject will be sent as soon as possible."

Although the Shipping Companies say they cannot insist, they inform us that they have put on pressure to avoid the expense of being saddled with small-pox cases, and the result is shown by a cessation of the dumping of small-pox cases in African ports from ships coming to Durban, ever since this pressure was put on, i.e., in 1931.

The Port Health Officer at Durban states (November 1932), that most people arriving from India today either carry certificates of recent vaccination, which he can accept, or show obvious signs of recent vaccination or immunisability to small-pox.

In that connection he refuses, with my approval, certificates from chemists, and any person whose *land fides* we at this end are unprepared to trust.

*British India ships arriving at ports of Durban having had on Board one or more cases of Small-pox, 1929-1931.*

Vessel.	Cases Landed.	Date of arrival.	No. of passengers, etc., Quarantined.
1929-30.			
1. Karapara .	1 at Mombasa .	1st May 1929 .	99 Deck passengers, to Salisbury Island.
2. Karagola .	1 at Zanzibar .	29th May 1929 .	85 Deck passengers, to Salisbury Island.
3. Karoa .	{ 1 at Zanzibar . 1 at Delagoa Bay. }	18th September 1929.	65 Deck passengers, to Salisbury Island.
4. Karoa .	1 at Zanzibar .	13th November 1929.	75 Deck passengers, to Salisbury Island.
5. Khandalla .	1 at Zanzibar .	11th December 1929.	65 deck and 10 second class on Salisbury Island.
1930-31.			
1. Karoa .	Small-pox on S. S. 'Elora', passengers transhipped to Karoa at Mombasa.	5th January 1930	85 Deck and 13 second class on Salisbury Island.
2. Karagola .	4 cases at Zanzibar .	22nd January 1930.	53 deck and 9 second class on Salisbury Island.
3. Khandalla .	1 case at Boira .	5th February 1930	76 Deck passengers on Salisbury Island.
4. Karapara .	1 at Delagoa Bay .	10th February 1930	60 deck and 6 second class on Salisbury Island.
5. Karoa .	1 case reported at Dar-es-Salaam, after ship sailed.	5th March 1930 .	....
6. Karagola .	1 at Zanzibar .	10th March 1930 .	40 deck passengers on Salisbury Island.
7. Khandalla .	{ 1 at Zanzibar . 1 at Delagoa Bay. }	2nd April 1930 .	80 deck passengers and 21 second class on Salisbury Island.

Apart from the regulations under Government Notice No. 932 of the 23rd May 1930, above quoted, our only legal restrictions on arrivals in the Union are as under:—

*Act No. 36 of 1919.*

*Section 96.*—Every unvaccinated adult person, or the parent or guardian of every unvaccinated child, in or entering the Union shall cause himself or such child to be successfully vaccinated within twelve months after the commencement of this Act or after entering the Union as the case may be, and shall, within the same period, transmit to a registrar of vaccination the appropriate certificate signed by a district surgeon, public vaccinator or other medical practitioner.

The conditions and exceptions described in section ninety-two shall *mutatis mutandis* apply to any adult person or child described in this section.

A person shall be deemed to be unvaccinated if he has not been, or fails to prove that he has been, successfully vaccinated.

*Regulation 16 of Government Notice No. 978 of 16th June 1924. (Port Health Regulations.)*

The Port Health Officer may require the vaccination of any person on board of any vessel who, in his opinion, may have been recently exposed to the infection of small-pox and who does not produce evidence to his satisfaction of successful vaccination against small-pox during the five years immediately preceding; provided that any such person may—

- (a) be vaccinated by the port health officer with calf vaccine lymph free of charge; or
- (b) at his own expense employ any medical practitioner to perform the vaccination;
- (c) be exempted from the requirement if considered by the port health officer not to be in a fit state of health to undergo vaccination.

Any person who fails to comply with any instruction or requirement lawfully issued or made under this regulation shall be liable to the penalties provided for a contravention of these regulations, and in addition the port health officer may prohibit the landing of such person.

## APPENDIX 30.

## REPORT OF THE COMMITTEE ON RURAL HYGIENE.

*Cape Town, 22nd November, 1932.*

The Committee on Rural Hygiene was constituted at the first Plenary Session of the Conference, the members being—

General J. D. Graham.

Dr. A. Damas Mora.

Dr. J. de Sousa.

Dr. H. W. Dyke.

Dr. D. Duff.

Dr. J. L. Gilks.

Dr. A. J. Orenstein (Rapporteur).

The Conference having decided that any member of the Conference is privileged to attend meetings of all committees and to address them the following Delegates attended the first two sessions of the Committee held on the 17th and 18th November, 1932, namely: Drs. N. M. MacLennan, H. R. F. Nettle, R. R. Scott, F. C. S. Hinsheek, P. J. du Toit, R. M. Morris, and W. H. Smith.

At the first session General Graham was elected Chairman, and Dr. Orenstein, Rapporteur.

*General.*—In introducing the subject to the Committee the Chairman indicated the many difficulties which are inherent in it. He drew attention to the work of the European Conference on Rural Hygiene organised by the League of Nations, and to the valuable report published by it, and referred to the League's Council meeting on the 15th October, 1932, which invited the Health Committee to arrange for the preparation by its Bureau of a report on the practicability of holding a conference on rural hygiene for the Far Eastern countries.

He observed that the question of rural hygiene was now a burning one throughout the world, and it was appropriate, therefore, that the opportunity of this Conference be utilised to discuss this matter, which is one of the utmost importance for Africa.

The opportunity having been given to members of the Committee and the others who attended the sessions to recount the organisation and experience in the countries they represent, the following general principles emerged:—

- (a) That in countries with a large backward native population it would be, generally speaking, inadvisable to separate preventive from curative medicine, in so far as the personnel which comes in direct contact with the populace is concerned. The native races, in most countries, have to be convinced first of all that the personnel of the health organisation has the good of the people at heart, and that it can and will help them. This can be demonstrated most easily through curative activities, which provide an opportunity for tangible demonstration of helpfulness.
- (b) That neither preventive nor curative measures can achieve a marked degree of efficiency without full co-operation between the administrative and technical departments of government and the health department.
- (c) That most important in the amelioration of health conditions are measures directed towards the raising of the economic status of the populace; this automatically results in the improvement



of two, at least, of the most important factors operating towards raising the standard of national health, *i.e.*, nutrition and housing.

- (d) That education in elementary hygiene is one of the most important activities. This should commence in the primary schools, and it should take the form of instruction in practical hygiene and not, as is at present too often the case, theoretical instruction principally in elementary anatomy and physiology.
- (e) That both in the preventive and curative organisations in many African territories, whether colonial or dominion, and probably elsewhere, native personnel must be utilised to the fullest possible extent.
- (f) In view of the limited time at the disposal of the Conference and of the great variations in the several African countries in such fundamental matters as endemic diseases, racial constitution and distribution of population, its occupations and educational attainments, it was recognised that no attempt could be made to formulate detailed recommendations. It was considered, however, that the maximum utility could be achieved by dealing only with the more important of the aforementioned principles, which are generally applicable to all countries with a predominant native population.

It would seem, therefore, best to divide this Report into sections based on the principles enumerated above.

(1) *Preventive and Curative Functions not to be separated in Field Personnel.*—The experience of all members of the Committee definitely points to the inadvisability of separating preventive and curative functions in the rural areas of most of the countries under consideration. There was unanimous agreement that while this can be, and is being, done in the larger urban areas, in so far as rural areas are concerned the confidence of the populace can only be won by tactful demonstration of the direct value of the health personnel to the individual. A cured patient becomes a centre of propaganda. Furthermore, therapeutic activity provides opportunity for health propaganda by word of mouth. It is felt, moreover, that the whole of the personnel of the medical department must be impressed with the importance of utilising every opportunity of contact with patients and the community, in order to give friendly instruction in simple language in elementary hygiene, both personal and communal. As one of the Delegates put it: "The dispenser should be given a little more instruction in public health and the sanitary inspector a little more instruction in treatment. For this, a knowledge of the vernacular is essential."

(2) *Co-operation between Government Departments.*—It not only appears to be axiomatic on general grounds, but is also demonstrated by actual experience, as related by members of the Committee, that satisfactory results can only be achieved by complete co-operation between the various departments of government. The health personnel, no matter how zealous and efficient, can achieve but little if it has not the full co-operation of the administrative authorities, and of such departments as Agriculture, Veterinary, Education and Police. It would appear, therefore, of outstanding importance that officers destined for administrative work in rural areas, especially in native territories, should receive a satisfactory course of instruction to impress on them the importance of preventive and curative medicine, and the bearing these have on the general welfare of the populace. The co-operation which must exist in order to achieve satisfactory results should be specially stressed in such instruction. It was particularly emphasised that the courses in public health now provided in home countries for officers of the administrative colonial services should be carefully reviewed and, if necessary, re-organised in such a manner as to instil practical knowledge in public health with special emphasis on the essential rôle of administrative co-operation and responsibility.

(3) *The Economic Status of a Community in its bearing on public health.*—No community can be healthy unless its economic status is sufficiently high to provide at least reasonably effective housing and particularly a balanced and sufficient ration throughout the year. Especially can no community be healthy if it suffers from time to time from periods of famine or semi-famine. Probably the outstanding urgent problem so far as the native races are concerned is to make it possible for them to have a continuous supply of sufficient and well-balanced food, and the next most important problem is housing. It may therefore be said without fear of serious contradiction that the first task before the administrations of predominantly native territories is the raising of the economic status of the population.

In an under-nourished populace, especially if it is subjected to periods of famine or semi-famine, the mere treatment of disease, no matter how effectively and widely carried out, will achieve but negligible results.

(4) *Education in Hygiene.*—It was agreed that the teaching of hygiene and elementary sanitation should be given a prominent place in the curriculum of all schools. It is essential that training schools for teachers should lay special stress on instruction in hygiene and the instruction should include methods of teaching children the elements of hygiene. In primary schools use should be made of primers based on hygiene. Such primers are now used in several colonies.

The services of district medical officers and the subordinate medical staff should be utilised where necessary in initiating instruction in teaching hygiene and sanitation both in teachers' training schools and in ordinary schools. It is to be emphasised that hygiene and sanitation teaching should be simple and practical, and that the teaching of these subjects need not and should not be complicated by instruction in anatomy and physiology under the guise of "Hygiene"—as is now apparently often the case.

In the work of education in hygiene and sanitation, auxiliary agencies can be advantageously utilised. Among these the Boy Scout and Girl Guide movements, the Junior Red Cross, and Missionary work are already playing a very important rôle, and these should be encouraged and expanded in every possible way.

Education of the adult by word of mouth in dispensaries and hospitals, at communal meetings and specially organised gatherings—at which the use of lantern slides and the cinema is a very valuable aid and attraction—should be encouraged and utilised as much as possible. From several territories very encouraging reports have been heard by the Committee on the results of such activities as are enumerated herein.

(5) *Native Staffs.*—(a) It is considered that the type of organisation which would give the most satisfactory results within the economic means available to most of the territories, should be based on strategically placed hospitals staffed by one or more medical officers, and adequate nursing and other personnel—and supported by outlying dispensaries staffed by subordinate personnel only on which the principal burden of the work must in necessary cases rest.

The senior personnel should be provided with adequate means of transport.

In native territories the subordinate personnel will have to be principally native.

A great deal is being done in most African territories towards the training of natives for curative and preventive work. In some territories a very high degree of training is given; in others it is difficult to find a sufficient number of natives with the general education essential to enable them to be trained for the more advanced subordinate health activities. In some territories the special difficulty is to find native females with the essential minimum education for training as nurses and midwives. It has, however, now been proved by experience that in every African country there is already a considerable number of natives capable of being trained for at least the lower positions in the subordinate personnel, both in the curative and preventive side of public health work, and that this number is growing and can be increased

and brought up to a higher standard by providing appropriate training institutions. Such training institutions should be intimately connected with the larger hospitals, so as to ensure good practical experience, and the training should be given by members of the staff selected for their fitness—not only in teaching their own subjects, but in dealing with natives. These institutions should have hostels at which the pupils should live throughout the period of their training.

Similar institutions should be provided for the training of health personnel.

(b) It is probable that in some territories, for some years to come, it will be possible to give only very elementary training to natives, until the general educational level is raised. But experience has shown that those so trained have proved very valuable workers when carefully selected and when working under close supervision.

(c) A very urgent need exists for the training of native women in midwifery and maternal and child welfare work. In several countries it may at present be difficult to find suitably educated women for training; on the other hand in a number of territories such women are now available, but there is a lack of opportunity for training. In countries where such women are available, it is considered essential that opportunity for training should be provided, and in those where no sufficiently educated women are at present available, endeavours should be made to educate selected girls with a view to their being later trained in midwifery, maternal and child welfare work.

(6) *European Staffs.*—With regard to European public health personnel, it was specially stressed that the members of this personnel should be carefully selected, with a view to their adaptability to the special conditions of health work among natives. It was pointed out that a sanitary inspector with only urban training and experience finds great difficulty in adapting himself to conditions in native areas where friendly persuasion and tactful education must take the place of forcible measures. It was generally considered that even a specially sympathetic and tactful European sanitary inspector requires experience under supervision in the larger urban areas of African territories before he can be profitably sent out into rural native areas.

(7) *Missionary Activities.*—Missionary activities play a valuable rôle in both curative and preventive medicine, and this side of their work should receive material support—provided it is carried out in co-operation with, and under the supervision of, the Government.

Within such limitations as may be imposed by local circumstances, native councils and tribal authorities should be encouraged to take a progressively increasing part in public health work.

## APPENDIX 31.

## REPORT OF THE COMMITTEE ON DENGUE FEVER.

*Cape Town, 24th November, 1932.*

This Committee was appointed at the first Plenary Session of Conference and required to consider the advisability or otherwise of subscription to the draft Convention for Combating Dengue Fever, by the countries represented by its members.

It was constituted as follows:—

Dr. J. L. Gilks (Kenya)—Chairman.

Dr. W. H. Smith (Zanzibar).

Dr. R. R. Scott (Tanganyika).

Dr. J. de Sousa (Portuguese East Africa).

Dr. G. A. Park Ross (Union of South Africa)—Rapporteur.

After consideration of the position regarding Dengue Fever, epidemic and otherwise, in the countries named, the risks of conveyance of the disease, the conditions imposed by the Convention, and cognate matters, this Committee finds subscription to the Draft Convention advisable on the part of the countries named, and recommends the Conference accordingly.

## APPENDIX 32.

*Resolutions regarding transmission by Aircraft of Diseases other than Yellow Fever.*

1. In addition to the special application of the International Sanitary Convention for Aerial Navigation 1932 to Yellow Fever the Conference reviewed the provisions of that agreement from the point of view of the control which it provides in respect of the carriage of infection of other diseases by means of aerial traffic. It did not appear that the provisions in question would entail on administrations responsibilities or obligations which would be difficult to fulfil in practice, and that on the other hand they represent an obvious convenience and an important safeguard for public health.

2. One of the delegates of the Union of South Africa, Dr. du Toit, Director of Veterinary Services, made a valuable contribution to the Conference on the subject of transmission of Animal Diseases by Aircraft. (Appendix 27.) Although only a few of the issues raised are primarily of medical concern the Conference considers that this communication, and the recommendation with which it concludes, deserves the attention of the appropriate International authorities.

